THE REPERTORY OF ARTS, MANUFACTURES, AND AGRICULTURE.

No. XXXIII. SECOND SERIES. Feb. 1805.

Specification of the Patent granted to Edward Martin, *of Morriston, in the County of Glamorgan, Gentleman; for his Invention for making of Pig and Cast Iron, of every Description, from Iron-Stone, Iron-Mine, and Iron-Ore, and of re-melting, preparing, and refining of Pig and Cast Iron, of every Sort, and for the making of such Pig and Cast Iron into Wrought or Bar Iron, by using raw Stone, Coal, and Culm, to be worked and made by Blast.* Dated June 23, 1804.

To all to whom these presents shall come, &c. Now know ye, that in compliance with the said proviso, I the said Edward Martin do hereby describe and ascertain the nature of my said invention, and the manner in which the same is to be performed, and the method I use to make stone, coal, and culm to stand the blast, as follows; that is to say: To light the fire in the furnace, finery, or hearth, with free-burning wood; and as soon as the wood is sufficiently ignited, then to put on small quantities of raw stone, coal, or culm, free of dust

(broken into the size of a common hen's-egg); to continue to feed the furnace, finery, or hearth, with raw stone, coal, or culm, till it is quite full of vivid fire, before any blast is introduced; then (in making pig or cast iron) to charge the furnace, in the common way, with due proportions of raw stone, coal, or culm, clear of dust (instead of coke or charcoal), with iron-stone, iron-mine or iron-ore, and lime-stone; then to introduce the blast, in a very gentle manner, for the first twelve hours; then to increase the blast gradually day after day, for the first week of blowing, till the furnace is sufficiently hot and burthened; and then to blow to any extent the machinery or the furnace is capable of bearing. And by keeping the furnace regularly and properly fed with materials, and by keeping up a sufficient blast, the process will be completed. And in remelting, preparing, and refining of pig and cast iron, of every sort, and for making such pig and cast iron into wrought or bar iron, the foregoing method of lighting and feeding the hearth or finery till it is full of vivid stone, coal, or culm, must be pursued before the finery or hearth is charged with metal, or the blast introduced. Then by charging with metal, and feeding the finery or hearth with raw stone, coal, or culm, (instead of coke or charcoal), and by introducing the blast in the common way, the wished-for success will be produced.

In witness whereof, &c.

Specification

Specification of the Patent granted to Robert Cameron, *of Rosamond-street, Clerkenwell, in the County of Middlesex, Engineer; for Improvements in Sawing-Machines, and for a new Method of working Sawing-Machines.* Dated September 30, 1784.

With a Plate.

To all to whom these presents shall come, &c. Now know ye, that I the said Robert Cameron, in pursuance of, and in compliance with, the said proviso in the said letters patent contained, and the purport and true intent and meaning thereof, and of his Majesty's said most gracious intentions, do declare (by this instrument in writing, under my hand and seal duly executed) that the nature of the said invention of making my said new-invented improvements in sawing-machines, and my new method of working sawing-machines, and the manner in which the same is to be performed, appears from the plan or drawing, and index or references thereto made and explained, and hereunto annexed.

In witness whereof, &c.

Index to the above Plans.

Fig. 1, (Plate VIII.) in the above drawing is a section, lengthwise, of the principal operating parts of the machine, where A A is a moveable carriage, upon which the wood B to be cut is fixed. C C is the frame, in which is fixed the saws D D, and which, being moved to and fro saw the wood, which on the carriage A A, is moved towards the saws by means of the lever E, the ratchet-wheel and clicks F G and H, and the pinion and rack I and K.

The operation of the machine is as follows:

When the saw-frame C C is moved upwards, it moves the lever E round its centre O, and the click or pall G

being hung at one end to the lever E, between the centre and that end of the lever which is acted on by the saw-frame, and the other end of the click laying hold of the teeth of the wheel F, when the saw-frame rises, the wheel F is moved round its axis, and by the pinion I working into the rack K moves the carriage towards the saws; then, by the descent of the saw-frame, there is so much of the wood cut as the carriage is advanced forward *per* stroke. The other click H, which falls into the teeth of F, being hinged on a fixed centre, hinders the carriage from being drove back by the saw-frame when it descends cutting the wood.

To the above general description of a method of stretching a number of saws placed near one another, and a method of holding the wood while sawed, which will enable any person acquainted with such sort of mechanism to construct a machine for sawing the vaniers. The principle of the method of stretching the saws here represented, consists in making the saws, or the ends of the saws, of different lengths, so as to stretch one set of saws above or beyond the place where the other set are fixed or stretched. An example of this method is given in the drawing, where D D represent the saws, which in this instance are in two sets of different lengths: they are all fastened at the lower end at L to the cross rail of the saw-frame. At the upper end they are stretched by wedges M and N, which are placed one above the other, so that the plates fastened to the ends of the saws, to form buckles or conveniences for stretching the saws, may not be opposite each other in the two sets of saws; by this means the saws admit of being placed near together.

Fig. 2, is a representation of the saws without the frame. A, is a side-view of one of the short saws. B, is a side-view of one of the long saws. C, is an edge-

view

view of a number of saws stretched in this manner; that is to say, they are fastened at the lower end by the piece D, which goes through all the saws, and is fastened to the cross rail of the saw-frame. The figure at E F shews the buckles or contrivances for stretching them at the top end. The method of holding the wood whilst sawed consists in fastening the plank, or other piece of wood, to be cut, sidewise, to the carriage, and likewise supporting it under the edge. In Fig. 1 the piece of wood B is fastened to the carriage by means of the instrument P Q, resembling a cabinet-maker's hand-screw. It is likewise fastened to one or more places by means of the instrument R and S, resembling a vice.

Fig. 3, is a cross section of the principal operating parts, where A A is the saw-frame. B B, sections of the sides of the carriage. D, is the end of the piece of wood to be sawed, which is fastened at the end by the instrument E E, referred to in Fig 1, at the letters P Q. F F, is the instrument referred to in Fig. 1, at the letters R S, by which it is fastened at one or more places to the side of the carriage. G, is a piece going across the carriage, and supporting the piece of wood to be sawed under its edge.

Fig. 4, is a plan of the principal operating parts where A A is the carriage moving forward on the fixed frame B B, by means of the ratchet-wheel, pinion, and rack above described. C C, represents the end of the saw-frame. D, is the piece of wood to be sawed, which is fastened to the carriage at the end by the instrument E, referred to in Fig. 1, at P Q, likewise at F F, by the instrument referred to in Fig. 1, at the letters R S.

The above examples of the method of stretching the saws I likewise apply to the sawing of thin boards in general. I have described them as methods which I prac-

tise,

tise, although in vanier sawing, a number of saws, placed near one another, may be stretched by a wedge or other mechanical instrument going through a number of saws. And in order that it may stretch them all equally, it will be necessary to be at great pains to adjust all the saws to their proper lengths, which may be done by stretching all the saws separately by the same weight, and by means of a gage adjusting them to their lengths. Or vaniers may be sawed by a single saw, and a contrivance in the carriage to regulate the wood sidewise, and a contrivance in the saw-frame to regulate the saw sidewise, so as to perform as many operations on the same piece as may be found necessary; which last contrivance may be used with one or any convenient number of saws. Very narrow vaniers may likewise be sawed by means of circular saws, which are fixed on an axis, and move without it in one direction.

My new method of working sawing-machines for sawing of wood or stones consists in applying the power of the steam-engine to work these machines, either by d[illegible] application of the powers of the engine, or by ra[illegible] water to turn a wheel, which works the sawing-en[illegible]

My improvements in sawing-machines consists in a[illegible] ing these machines to the sawing of mahogany, and [illegible] hard woods used for vaniers, and to the sawing of [illegible] boards in general.

The methods by which I saw mahogany and [illegible] hard woods into vaniers, consists in fixing the wood [illegible] cut on a moveable carriage, and in fixing a saw, [illegible] number of saws, in a frame, which being moved t[illegible] fro saws the wood which on the moving carria[illegible] brought forward to be cut.

Speci[illegible]

Specification of the Patent granted to John Swift Saxelbye, *of the Town of Derby, in the County of Derby, White Lead Maker; for a Method of making White Lead different from the Methods now practised and used, and without the Aid of Horse-Litter or Tanner's-Bark, or both of them.* Dated May 14, 1804.

To all to whom these presents shall come, &c. Now know ye, that in compliance with the said proviso, I the said John Swift Saxelbye do hereby declare that my said invention is described in manner following; that is to say: Instead of applying heat, or causing an increase of temperature (in the pots or vessels containing the acid, and the metallic lead intended to be subjected to the process by which white lead is made), by means of horse-litter or tanner's-bark, or both of them, or by means of the gradual decomposition or change which takes place during the decay and rotting of those, or any other remains of organized bodies, I do avail myself, and make use of that augmentation of temperature or sensible heat which is produced and communicated by the combustion of fuel. And I do regulate and manage the said heat so that the same shall be kept within the proper limits, and shall be sufficient to cause the intended change or oxydation of the lead in an effectual manner, without causing the acid in the pots to be volatilized to a greater degree than is necessary for the intended purpose, and the particular means by which I do perform the same are described as follows: I make my fire or fires in a proper stove or receptacle, with its apertures, flues, chimnies, registers, dampers, and other parts which require no particular description, because it will be sufficient if the construction thereof be such as that the

the operator or attendant shall have it in his power to manage and regulate the fire and the communication of heat in the usual manner. The said stove is so built or placed as to communicate heat as generally and uniformly as may be to a room or space constructed of such materials and dimensions as to receive the pots containing the usual charge of metallic lead and acid, and to admit of the same being regularly placed and disposed, and shut up, but that none of the smoke, vapours, or other immediate exhalations from the fuel should be admitted within the said room or space. And I do not only cause the quantity of heat to be regulated by an attention to the quantity or weight, and the nature or kind of the fuel to be consumed in any determinate time; but I do still more completely enable my operator to keep the temperature at the requisite degree by introducing or inserting one or more thermometers into the room or space containing the pots, but leaving their scales or graduations so placed as to indicate any changes of heat that may take place in the said room or space. And the said thermometers may be of any proper and fit construction, according to the well-known methods, wherein mercury or any other fluid is used, or wherein all the parts are solid, as in the instruments called pyrometers. And moreover, and for the purpose of preventing any wasteful or pernicious excess of heat, I do construct and make, at some convenient place in the upper part of the said room or space, a valve, or shut or aperture, capable of being opened to let out some of the heated air or elastic fluid when the same is requisite to be done. And I do connect with the cover or lid, or stopper, of the said valve, either the arm of a float, supported by the mercury of a large thermometer, or else the arm of a pyrometrical apparatus, or expansion bar, so that by an action,

Fig. 2.

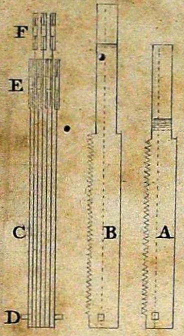


Fig. 1.

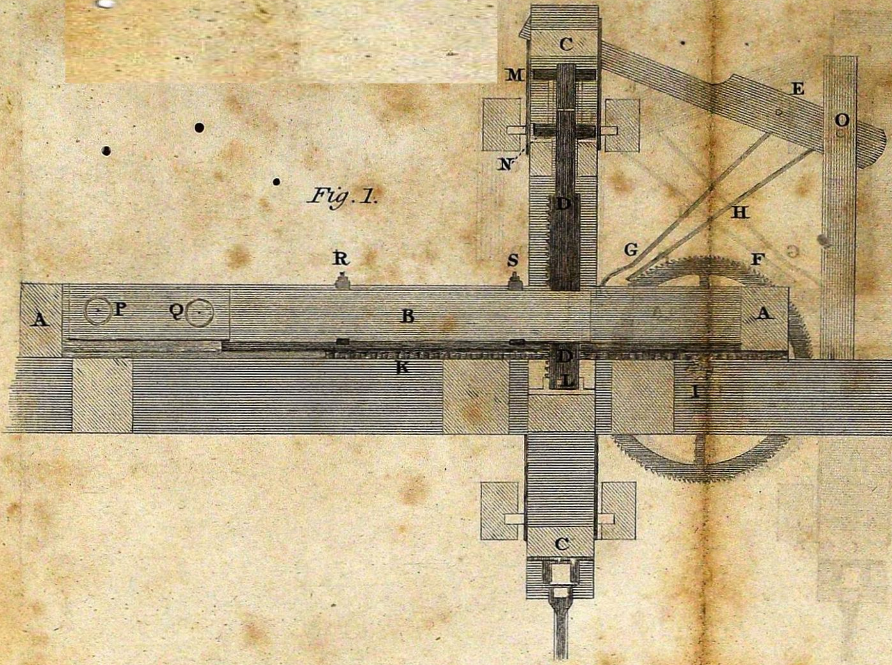


Fig. 3.

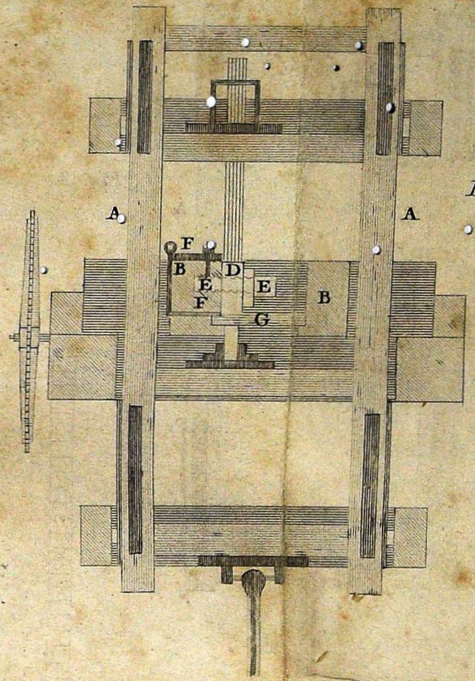


Fig. 4.

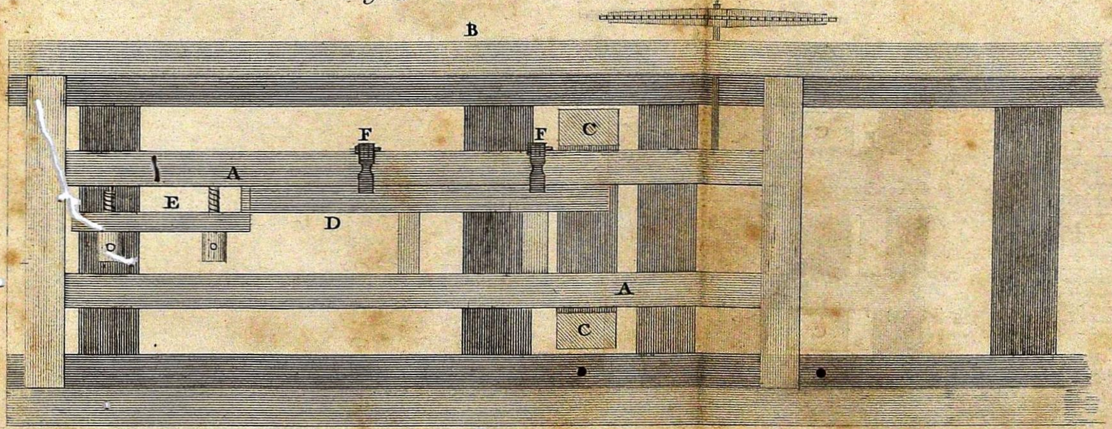
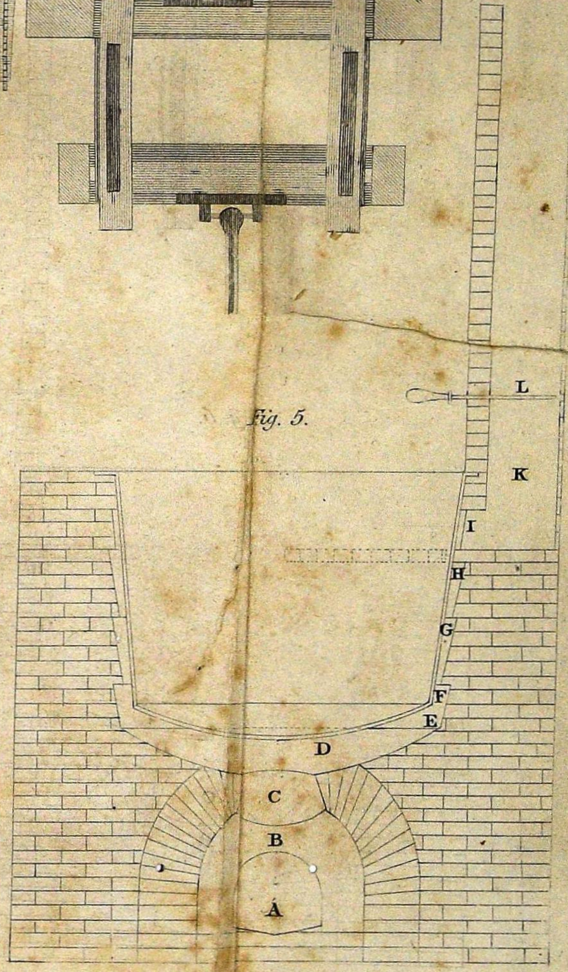


Fig. 5.



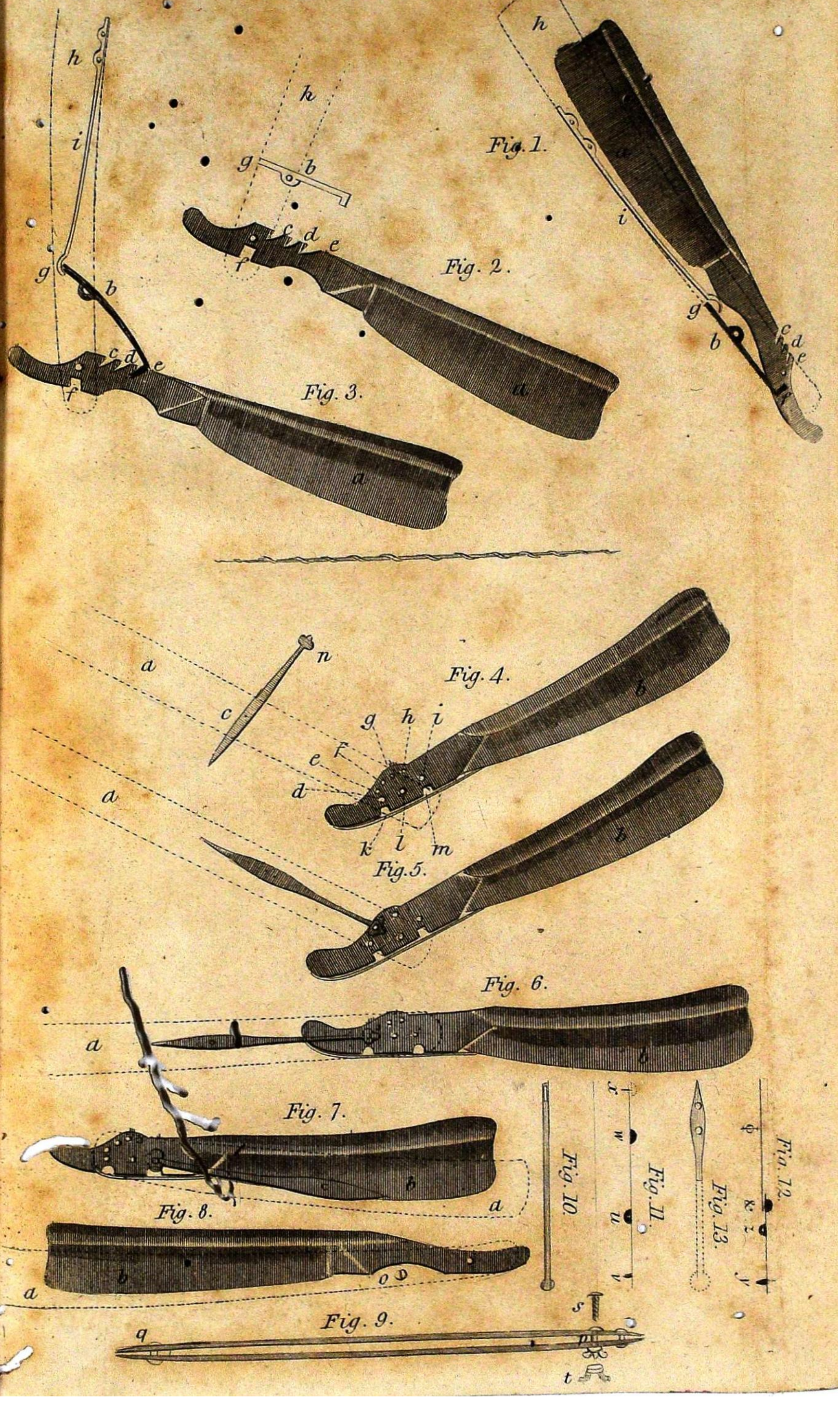


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10
Fig. 11.
Fig. 12.
Fig. 13.
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action, which every mechanical man acquainted with subjects of this nature will readily apprehend, the increase of temperature shall cause the said valve to be opened, and, contrarywise, a diminution of temperature shall suffer the same to be again closed. And I do find, by experience, that the temperatures best calculated for these operations are, that the said room or space should be kept between ninety and one hundred degrees of Fahrenheit's scale during the first ten or twelve days, and from one hundred to one hundred and ten for the next eight days; and that the heat be regularly and equally increased about ten degrees for each successive portion of eight days until the expiration of about six weeks in the whole from the commencement of the operation, or until the vinegar or other acid liquor shall have been evaporated; at which period the pots are to be taken out, and the white lead separated and ground for sale as usual. Lastly, I do in some cases make use of water or steam as the medium of communication through or by which the heat, so as aforesaid produced, is transmitted into the said room or space containing the said pots; and in these last-mentioned cases the said water or steam may be still farther and usefully employed for general purposes that constitute no part of my said invention, though the economy of the said invention may be thereby in such cases promoted. And I do then, if needful, make thermometrical observations on the temperature of the said water or steam, in order the better to regulate and govern my fire, and the general process of my said invention dependant thereon.

In witness whereof, &c.

Specification of the Patent granted to Edward Greaves, *of Sheffield, in the County of York, Razor-Manufacturer; for Improvements on Razors.*

Dated August 4, 1804.

With a Plate.

To all to whom these presents shall come, &c. Now know ye, that I the said Edward Greaves, in compliance with the said proviso, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is particularly described and ascertained in the above drawings, sections, plans, or plates, and the following description thereof; that is to say:

Fig. 1, (Plate IX.) represents the razor with the spring and catch. *a*, is the blade; *h*, the handle; *b*, the catch; and *i* is the spring. A pin passes through the hole of the catch at *b*, and is rivetted in the handle *h* upon this pin as a centre; the catch *b* is moveable. Also the spring *i* presses against the catch at *g*, by which means the return end thereof is pressed in the notch *f*. In this figure the razor is represented as shut, and is kept so by the pressure of the spring *i* against the end *g* of the catch *b*.

Fig. 2, shews the blade *a* with the notches *c d e* and *f*, and also the catch *b*, together with part of the handle *h*; and the razor in this figure is represented without the spring, and the catch not in use.

Fig. 3. In this draught is shewn the blade, the handle, the catch, and the spring: the razor is represented in the position in which it is generally used. In this position the catch *b* secures the blade *a* by the pressure of the spring *i* against the end *g* of the catch *b*.

Fig.

Fig. 4 represents the handle *a* and the blade *b*; also the spring *c d e f g h*, &c. are holes in the blade tang. *k* and *m* are hollowed in the tang in which the pin *n* of the spring *c* slides when in contact with the tang of the blade.

In Fig. 5 is shewn the blade *b*, so situated (with respect to the handle) that the pin *n* of the spring *c* is in the hole *f*.

In Fig. 6 is seen the pin *n* in the hole *d*.

Fig. 8 shews the pin *n* of the spring *c* in the hole *i*. In the positions of Figs. 5 and 6 the blade is secured in those positions by the pin *n* of the spring *c* in the hole *f* in Fig. 5, and in the hole *d* in Fig. 6. Also the blade is shewn in Fig. 7, where the blade is represented as shut in the handle; the pin *n* secures it in that situation by being in the hole *i*. Fig. 8 is the profile view of a razor, in which the blade may be secured in any position (with respect to the handle) by means of a screw and a nut. The head of the screw is denoted by the letter *o*.

Fig. 9 shews the handle, &c. of the razor viewed edgewise. In this representation *g* is the rivet at the end of the handle, and *r* is the rivet passing through the tang at the other end; *s* is the screw, and *t* is the nut. In this figure at *p* is shewn the nut and the screw in use.

Fig. 10 is a spring, which may be substituted for the spring *c*, in Fig. 4.

Fig. 11 is a section of the spring in Fig. 10, and is a pin passing through the slit in Fig. 10, to prevent the spring rising above the surface of the handle, and the slit in Fig. 10 allows a motion in that spring. At *u* a spring passes through the hole and the handle, and a person by pressing upon the projecting piece at *w* will raise the pin *v* out of the hole in the tang of the blade.

 Fig.

Fig. 13 is a similar spring in two pieces, the shaded part denoting one piece, and the dotted line denoting the other.

Fig. 12 is the same in section where the spring Φ_o presses against the other at *x*; the latter being secured at *z* prevents the pin *y* leaving the hole in the tang of the blade; therefore if you press the piece at & the pin at *y* is raised.

My invention is not confined to any particular kinds of razors, the improvements being applicable to all; neither is it confined to any particular number of notches on the back of the tang, but may be made with one, two, three, or more, as may be required, or fancy suggest; nor is it confined to the exact shape or form of the springs, as it must evidently appear to every intelligent workman that the same may be varied without departing either from the particular or general principle of any of the improvements above set forth and shewn in my invention.

In witness whereof, &c. ..

Description of an Improvement in the Striking Part of an Eight-Day Clock.

Invented by Mr. JOHN PRIOR, *of Nessfield, Yorkshire.*

With a Plate.

From the TRANSACTIONS of the SOCIETY for the Encouragement of ARTS, MANUFACTURES, and COMMERCE.

A Bounty of Thirty Guineas was voted to Mr. PRIOR *for this Invention.*

I BEG leave to state some of the advantages arising from my improvement in the striking part of an eight-day clock. First, its principle consists in a wheel and fly,

fly, with six turns of a spiral line cut upon the wheel, for the purpose of counting the hours. The pins below this spiral elevate the hammer, and those above are for the use of the detent.

This single wheel serves the purpose of count-wheel, pin-wheel, detent-wheel, and the fly-wheel, and has six revolutions in striking the twelve hours.

Suppose a train of wheels and pinions, used in other striking parts, to be made without error, and that the wheels and pinions would turn each other without shake or play. Allowing the above supposition to be true, which every mechanic knows it is not, my striking part will be found six times superior to others in striking the hours 1, 2, 5, 7, 10, 11, and twelve times in striking 4, 6, 8, and eighteen times in striking 3, 9, and 12.

I have designedly made a defect, in the model herewith sent *, in striking two and three o'clock, to shew that what I have now advanced will, upon the trial, be found to be true.

In striking two I have purposely made an imperfection, equal to the space of three teeth of the wheel; and in striking three an imperfection of nine or ten teeth, and yet both these hours are struck perfectly correct.

The flys in clocks turn round at a mean about sixty times for every knock of the hammer, but mine turns round only three times for the same purpose; and suppose the pivots were of equal diameters, the influence of oil on them would be as the number of revolutions in each †.

It would be better for clocks if they gave no warning at all, but the snail-piece to raise a weight somewhat

* Preserved in the Society's repository for public inspection.

† See Cummings's Elements.

similar

similar to the model now sent for the inspection of the Society.

REFERENCES to Plate X.

Fig. 1, A, the large wheel, on the face of which are sunk or cut the six turns of a spiral.

B, the single worm-screw, which acts on the above wheel, and moves the fly C.

D, the spiral work of the wheel A. The black spots shew the grooves into which the detents drop on striking the hour.

E, the groove into which the locking piece F drops when it strikes one, and from which place it proceeds to the outward parts of the spiral in the progressive hours, being thrown out by a lifting piece H, at each hour; the upper detent G being pumped off with the locking piece F from the pins in the wheel A.

In striking the hour of *twelve*, the locking piece, having arrived at the outer spiral at H, rises up an inclined plane, and drops by its own weight to the inner circle, in which the hour *one* is to be struck, and proceeds on in a progressive motion through the different hours till it comes again to *twelve*.

I, the hammer-work, made in the common way, which is worked by thirteen pins on the face of the spiral.

Fig. 2, K, the thirteen pins on the face of the spiral, which work the hammer-work.

L, the outer pins, which lock the detent.

M, the pump-spring to the detent.

On

Useful Hints for the Management of a Farm-Yard.

By Charles Howard, *Esq.*

From Hunter's Georgical Essays.

IT is not sufficient to attend to the general theory of agriculture, for however scientifically this may be studied, unless the minutiæ of the practice be indefatigably observed, the system of husbandry must remain incomplete. Of the less branches of this art, one of the most considerable, and of the greatest importance, is the good order and economy of the farm-yard. To raise the most valuable and largest quantity of manure should be the great object of every farmer; upon this circumstance the vigour and health of his land will principally depend. Every thing, therefore, that can contribute in the smallest degree to the size or quality of the dung-hill is of the utmost consequence.

For this purpose I should recommend farm-steads to be built with very requisite convenience, which, by attending to the real utility, rather than the appearance of the buildings, may be done at a moderate expense. The tenant can amply afford a proper rent for such conveniences, and it is very much to his interest, as well as to that of the landlord, to have them. Grazing farms, which do not produce great quantities of straw, require to be better accommodated with sheds and houses for cattle than large arable farms; as, upon the latter, economy of straw cannot be so closely attended to. The yard will be found more convenient if divided into two parts; as it is always desirable to separate the younger stock from those that are older; so circumstanced, they are more at rest, and consequently thrive better. One pump will water both yards, which is far preferable to the old mode of permitting the cattle to go to an adjoin-

ing

ing pond to water, by which a great quantity of manure is lost, and much ground poached by their feet. The yard should form altogether a shallow basin, to preserve the liquid part of the manure; and it will be found very advantageous to lay at the bottom a considerable quantity of sand, or any absorbent upper soil. This should be done every spring and autumn, when the cattle are confined *all* the year; but if they are only taken up in the winter, once will be sufficient: each time the yard is cleared of the dung a very large portion of highly-valuable manure for grass land will be obtained from the bottom of the farm-yard, which may be again replenished with sand or earth. It is not within the limits of a short Essay, like the present, that all the advantages of this mode can be pointed out, the value of it can alone be ascertained by those who have practised it. The increased quantity of manure is very great, all the superfluous moisture is absorbed by it, and the farm-yard is kept in a much drier, and more comfortable state than it otherwise could be, particularly where attention is paid to the value of straw. But I admit that there are situations where, from the difficulty of procuring proper materials, this system can be only partially observed.

As soon as, from the severity of the weather, or bareness of the pastures, it is thought necessary to fodder the cattle, I should recommend them to be brought into the farm-yard, in preference to giving them hay or turnips whilst out. The cattle will be much better sheltered, and a larger quantity of manure will be made. Experience convinces me, that the dung of animals laid upon the ground at any season of the year, in its unfermented state, does not by any means enrich the land so much as when it has undergone a quick fermentation, with a small quantity of litter. Let as many cattle be tied up in

houses

houses or sheds as the buildings will admit of, particularly the fattening beasts. Cows and calves thrive better, and require less meat in the house, than when exposed to all changes of weather in the farm-yard; the waste is not near so great, and consequently the manure is improved by the straw being eaten, rather than trodden down into litter. I have before said, that the great object of the farmer should be to keep the largest possible stock of every kind of cattle, to augment and improve his dunghill: I would therefore have every care taken to make the straw go as far as it can; and I speak of straw more particularly, as I do not consider hay, in general, a profitable crop for the farmer. When we observe the common method of using straw, it is not to be wondered at, that it should be under-valued; it is too frequently and injudiciously made the sole food of cattle, which (especially when coarse and ill-gotten) they shew by their daily decrease of condition; an obvious circumstance, that it does not afford them sufficient nutriment: such cattle, in the spring, are turned from the farm-yard to grass in so poor a state, that two or three months are often necessary to get them again into the same condition they were in when taken up in the autumn. This proves a severe check to the young cattle, which it very materially injures, and is a great drawback on the farmer's profit. But let straw be made subservient to turnips, carrots, cabbages, kale, potatoes, &c. Let a certain portion of these crops, according to the nature of the farm, be given to the cattle, and a very large quantity of winter stock will be kept in a progressive state of improvement; which upon all soils will prove exceedingly profitable. I believe it will ever be found for the interest of the farmer to keep all his stock in high condition, more particularly young animals, as they will come

sooner to profit, and are at all times saleable; it is well known that animals, when fat, consume much less food than when in a lean state.

I have paid great attention to the nutritious qualities of the turnip, not only in the feeding of cattle, but of horses and store pigs; all of which I find to thrive exceedingly well upon them in their raw state. It has been my practice to give my draught-horses about a peck and a half of turnips each every night, with a fodder of straw; and I am of opinion, that they thrive as well, and keep in better health by this mode, than they would do upon the best hay. The turnips are given to them whole, but without the tops and fangs. On land where they draw clean, and in dry weather, they will not require washing; but if dirty, they must be washed; this, however, is seldom the case with me. In the day-time, whether worked or not, they have hay, and a small quantity of corn, with sometimes an addition of a few carrots in the stable; but on days of rest they are turned into the farm-yard for two or three hours, where they enjoy the turnips with the cattle. By these means my draught-horses are kept in good condition, at a comparative small expense, and a great consumption of corn is avoided; their bodies are temperate, and their legs are constantly clean. My cattle have turnips in proportion to their respective conditions and ages; but all have some, and are thereby kept in a state of improvement; my general plan is, to let them all out into the farm-yard about four hours during the finest part of the day, at which time they all eat turnips, having straw only in the house, excepting the cows, calves, and those cattle which are fattening. Even my pigs, which are of the Scotch and Leicester breeds, eat turnips in considerable quantities; I find them

answer

answer very well for store pigs, with the addition of the little other meat they pick up in the yard.

The value of turnips, as food for sheep, has long been fully allowed. For cattle too they are gaining ground considerably, but I think are generally given only to such as are fattening, and to cows and calves. Store cattle are much neglected in the winter season; I have met with very few farmers who have made turnips a common food for their draught and young horses; or who have considered them valuable as food for pigs; but from my own experience I venture strongly to recommend them for these purposes; at first, perhaps, they will object to them. In a few days they will eat them a little, and when some begin to feed upon them, all the rest will quickly follow the example.

The Ruta Baga I have heard recommended as far superior for these latter purposes; and am inclined to think, from the closeness of its texture, and its sweetness, that it is more nutritious; but I have not been successful in raising a good produce; it appears to me to be a very precarious crop. I propose, however, to give it a farther trial; and should be sorry to say any thing that might tend to discourage the cultivation of a plant possessed of so many valuable properties. Carrots, cabbages, and kale, I consider as highly necessary crops upon all farms; the two latter particularly so upon strong soils; they are an excellent resource in long frosts and deep snows, when turnips are with difficulty procured. It is desirable to grow them as near the homestead as possible. I find the method of preserving turnips from the frost, as mentioned by Mr. Marshall in his "Minutes of Agriculture," page 199, of great use, as a constant supply is thereby provided, notwithstanding the weather. Before the frost sets in, I employ boys to assist my own

A a 2 labourers

labourers in cutting off the tops and fangs; the tops are carted home for the immediate use of the cattle, or spread upon grass land for the sheep. The bulbs are thus preserved: a layer of straw is spread in a round form upon a dry part of the land, and the turnips are carted to it; four or five loads are heaped and covered with straw; a little earth is put at the top, in the manner of potatoes; only, as they seldom lay long, quite so much care is not necessary. Thus they remain until a frost causes a demand for them in the farm-yard, at which time they are particularly serviceable, if they are led home without injury to the land or roads. They might also be protected thus for sheep, which would greatly lessen the consumption of hay in severe weather.

Corn, in the straw, I have cut in small quantities, and think it is very useful to give to horses in the day-time when it is required to have them fed quickly, that they may get to work again; but I am of opinion where chaff is plentiful, much of this will not be required.

On the Treatment of Farm Horses.

By JOHN BANNISTER, *Esq.*

From HUNTER'S GEORGICAL ESSAYS.

ON the economy of the stable depends, in no small degree, the profit or loss of the husbandman; since, if the working cattle are disproportioned either in number or size to the exigencies of the farm, or if properly adapted in these particulars, should turn out unhealthy, either from natural causes or an undue attention in the persons to whom the management of them is entrusted; or if they are over-worked, or, on the contrary, not kept with a sufficient degree of strictness to their labour; if

they

they are pampered too high, or have not a due allowance of food: in either of these cases the owner will find an evident diminution in his profits; and, if not timely redressed, a want of attention to these minutiæ, as they may at first sight appear, will increase, by slow progressions, till the evil may at length terminate in the ruin of those people who have been remiss in this part of their business.

The number, as well as size, of the working horses must depend on the situation, extent, and nature of the farm; since one team on a gravel, sand, or other light soil, will cultivate a larger proportion of ground in a given time than two on a clay, where the native adhesion of the soil enhances the difficulty of the several operations of the field, and where the deep and miry roads render a larger strength of cattle abundantly necessary. Again, the farmer whose fields are hilly and uneven will be under the necessity of supplying himself with more able horses to answer this superior strength of tillage, than another whose lot has thrown him on a level situation. Such people also who have a large proportion of wood land, or who from any other cause are obliged frequently to perform long journeys, demand an abler team than he, whose chief employment is the tillage of his ground, and is therefore rarely under the necessity of travelling on the road, except in the necessary conveyance of his grain to market, the proximity or distance whereof is an object of no mean import to the farmer; since, if his situation be in the vicinity of a market-town, more corn may be delivered in one day than in two or three where the barns lie at the distance of eight or ten miles, or perhaps farther, as is the case with many farms; and if the various items saved by this contingency were to be added together at the year's end, they would,

I am

I am persuaded, form a much larger sum than is generally imagined.

The proportion of meadow or feeding land to the arable is likewise to be considered in regulating the number of working cattle on the farm, since, when there is a due allowance of the former, there will be less employment for the horses; and consequently on these farms, where there is an equal division of arable and green land, one team will be amply sufficient, where there would otherwise have been a necessity to employ two or three.

The sex of the labouring cattle will likewise be determined by the nature of the farm, as it may be more convenient to employ geldings if there is a want of pasture, whilst a due portion of green land may encourage the farmer to drive chiefly mares, by which means he will have the advantage of breeding colts, and thereby of furnishing himself with a constant succession of young cattle at a trifling expense; and this is so material a consideration, that it ought never to be neglected where there is an opportunity of reducing it to practice; since, when a person is obliged to supply the deficiency of his team, whenever age or accident render it necessary for him to recruit his stock, by having recourse to the dealer, it forms a continual drain from his pocket, and lays him under the necessity of expending a considerable sum in the purchase of working cattle, which, when he has the advantage of breeding them on his own pastures, might be reserved towards the purpose of buying other stock, and his team would in all probability be more completely furnished with his own breed than by any which he could purchase from the horse-dealer, with whom he runs great hazard. Other advantages likewise attend the husbandman who is fortunate enough to possess a quantity of pasture land in due proportion to the arable; I mean

advantages

advantages pertinent to the subject in hand, for as to the general superiority of farms of this description over mere arable tenures, it is so manifest, as to occur in a thousand instances; but in this particular one of the management of the teams, I would mention the being able to turn out a sick or lame horse, and thus in many cases expediting a cure in a much more effectual manner, and at far less expense than if recourse were had to the farrier. Besides, where mares are kept in preference to geldings, a disorder which would totally disqualify the latter for business will render the former by no means less proper for breeding, and thus she may still continue useful in this particular, whilst her offspring supply her place in the harness.

In those countries where the ploughed land is stiff and perfectly free from stones, and where the pasture is of the richest kind, the use of horses is in a great measure supplied by oxen, which, being turned out of the team into the feeding pasture, bring a double profit to the owner. The expense of maintaining these creatures in good working order bears no proportion to the consumption in hay and corn required for the horses, besides the very material saving in the article of shoes, wherein a horse-team considerably enhances the blacksmith's bill. These advantages speak greatly in favour of an ox team, where the situation will admit of the practice; but where the land is stoney and uneven, and the roads hard and rugged, and where the farmer is not possessed of sufficient quantity of good fertile meadow land to admit of the beast being fattened on the pastures, when he has been worked a sufficient time: when either of these circumstances are wanting, it is certainly the most judicious method to employ a horse-team; for the ox, at best a slow mover, would make

make but very indifferent way on ground that is hard and stoney, as in that case he must necessarily be shoed, and this is a task of no small difficulty, these animals being endued with far less docility than the horse, and are generally cast whenever this operation is performed. Besides, where the farmer has no convenience of fattening the oxen when past their labour, he must often sell them at a disadvantage to the feeding grazier, so that on these considerations the horse is by far the most useful beast; but in deep miry countries, as I observed before, the ox may be employed to great advantage.

The horse is subject to a greater variety of disorders than any other of the animal race, and these are often aggravated by ill management; nay, I believe I might add, that more distempers are brought on by a neglect or improper regard to the creature, than what proceed from natural causes.

As the complaints incident to this animal are more numerous, so is he more susceptible of injury from the different vicissitudes of heat and cold than any other creature. The ox, when he has finished his stated task for the day, is turned abroad to feed, without any other care from the hind; whilst the horse is taken into the stable at the close of his labour, and diligently attended during the remainder of the day, and at night left to repose on a dry and well-shaken bed. The horse meets with an early attention in the morning, and is alternately fed and curried before he goes forth to work, in order to enable him the better to withstand the fatigues and labour of the ensuing day; the ox, on the contrary, fearless of the summer's sun and winter's blasts, is taken out of the field, and with very little ceremony harnessed for his work.

Such being the care required in the management of a working-team, how necessary to the farmer's interest is

it, to be provided with a set of domestics sober, honest, and diligent, who by obliging their horses to do a good day's work at whatever business they may be employed, and by a frugal, yet necessary allowance of meat in the stable, and by a proper attention to the dressing and well ordering of their cattle, will take care that their master's interest be promoted, and his welfare consulted in every particular. But however ardently the possession of servants with qualities like these is to be wished for, I believe there are few that have kept dependents of any kind who can boast of having often met with those which have turned out perfectly to their wishes; perhaps if we were to extend our inquiries in this particular from the prince on the throne to the villager, whose only attendant is a dirty girl; I say if we could search into the characters of these various degrees of servitors, we should find that all of them in their several stations, so far from studying the interest and profit of their master, directed their views towards enriching their own coffers, at the expense of their employer; and whilst the courtier has his parasites and dependents to share with him in the plunder of his Sovereign, the solitary domestic of the villager above-mentioned finds some char-woman or itenerant ballad-singer to receive the scraps of the pantry and the refuse of the kitchen.

In this progressive scale, there are none who study more arts of deception, and perhaps there are few of the several ranks and denominations of servants, from the palace to the cottage, who have fairer opportunities of exercising their dexterity in this way than those employed by the husbandman. Being brought up from their infancy in the lowest habitudes of trick and knavery, and observing in their parents, and in every one of their own order,

order, a kind of emulation at excelling in every mean art and chicanery, and consoling themselves with the satisfaction, that so long as they keep within the letter of the law, and are free from capital offences, they may with impunity continue in the practice of this lower rank of vices, it is matter of little surprise that they should imbibe their parent's notions: and thus the ploughboy is no sooner admitted into the stable, than he is initiated into the vices of that seminary, and shows himself an apt and ready scholar by pilfering his master's corn, which as it is given to his master's cattle, the waggoner (his worthy tutor) persuades him is a matter of trifling concern, and by no means a breach of the seventh commandment; till, by a frequent repetition of this crime, and from the force of example in his fellow-servants, he is led on to the commission of other acts, where this kind of casuistry does not so properly come in aid of his wounded conscienc.

Since these arts too frequently are practised in a farmer's stable, how careful ought he to be that his working cattle do not suffer either from the neglect of the ploughman, or from his over-solicitude to be possessed of a fat and sleek-looking team. Such horses may indeed attract the eyes of a gaping crowd at a country market, but will never answer the purpose of the farmer in getting through their daily labour with a moderate proportion of meat; and a due attention to these particulars would, I am persuaded, be the means of preventing many of the disorders to which this useful species of animals is naturally subject.

TO BE CONCLUDED IN OUR NEXT.

Letter

Letter from Mr. Boswell *respecting the Ship Economy, a Vessel built according to the new Method invented by him, for which he lately obtained a Patent *.*

Communicated by the Author in a Letter to the Editors.

Gentlemen,

As you had the goodness to insert in your Repertory of Arts † an account of the construction of the ship Economy, of London, built under my immediate direction, according to my patent, I hope the following relation of her performance at sea (which proves that she is equal to any other ship in every respect, and superior to many) will obtain also a place in your publication, and be acceptable to your readers, who know the importance of improvements of this nature in naval architecture, to a nation whose chief dependance is on her maritime strength, and where large ship-timber is every year becoming more scarce.

Extract of a Letter from Captain Alexander Smith, Commander of the Economy, to William Lushington, Esquire, Part-owner.

"Sir, Grenada, Oct. 15, 1804.

"I have the pleasure to inform you of the ship Economy's safe arrival here, with convoy, yesterday evening. We have had a very fine passage, and but one gale of wind. The ship performs as well as it is possible for a ship, is remarkably easy at sea, steers and sails well, and is perfectly tight. In the gale of wind the Epervier, M. W. sprung her foremast, the Robert Aylward, ditto,

* Vol. IV. page 430, of the new feries.

† See the fpecification, publifhed in the fecond volume, new feries, page 81.

a brig (master or brig named) Swinger, lost both top-masts, and parted convoy in lat. 14, 39 N. Our ship behaved extremely well, and never strained a rope-yarn.

(Signed) "ALEXANDER SMITH."

The unexagerated veracity of the above account may be implicitly relied on, in addition to which I have to state, that the Economy also sails remarkably fast; as a proof of which, having been detained in the Thames for part of her outfit twenty-four hours after the convoy had sailed (when she was outward bound to the West-Indies in August last, 1804) she afterwards passed by most of the fleet between the Thames and Portsmouth, and was one of the first vessels which arrived in Portsmouth harbour.

Having found that the room taken up by the transverse frames in the Economy was objected to; I take this opportunity to assure your readers, that I am acquainted with very sufficient means, within the limits of the patent, for reducing this inconvenience to so small a degree, as to render it an object of no material consequence in any other ship built in the same manner: and, besides this, at all events, if a vessel built on this plan will cost much less than one of the usual construction, stowing precisely the same quantity, it is evident this can be no material objection. I can moreover prove to any unprejudiced person, that there is more space gained internally, from the smallness of the vertical timbers in the intervals between the fore and aft ribs, (and from the absence of knees) than can possibly be occupied by the constituent parts of the transverse frames.

I am, Gentlemen,

Your very humble servant,

JOHN WHITLEY BOSWELL.

Experiments

Experiments and Observations on the Feathers and Down of Domestic Fowls. By M. Parmentier.

From the Annales de Chimie.

It is not merely for their flesh, their fat, and their eggs, but also for their feathers, that fowls are pursued in the field and reared in farm-yards; but these feathers, which nature has given them for their clothing, and also to form the principal instrument of their flight, have different destinations of more or less utility to society.

Some remarkable for their softness and elasticity, for the beauty of the filaments which compose their plumage, serve to shade the helmet of the warrior, to adorn the tresses of the fair, and to form those elegant plumes with which the most splendid articles of furniture are surmounted.

Others, valued on account of the length and the solidity of their quills, and the facility of cutting them into any desired shape for writing, become the interpreters of our thoughts; they advantageously supply, among the Europeans, the place of the reed, which the Arabs employ, and the style with which the ancients engraved their tablets.

Finally, there are feathers adapted for filling those cushions upon which, fatigued with the labours of the day, we repose during the night; it is among these that Voluptuousness herself has selected a species of peculiar fineness, lightness, and elasticity, to form the bed upon which she tastes the sweets of repose.

Plumes and other Ornaments of Luxury.

The most beautiful and the most valued of all plumes are those made of the feathers of the ostrich; this singular biped, which has the feet and parts of generation of a quadruped,

quadruped, the head of a bird, and also the faculty of laying eggs; the stomach and intestines of the ruminant animals, and yet the gizzard of a fowl; which has its body covered partly with feathers, and partly with hair, and, finally, wings, which do not serve it as instruments for flying, but only for balancers, with which it supports itself, and easily preserves its equilibrium in the extremely rapid courses which it performs in the deserts of Africa.

The plumage of the male is black, with some grey and white feathers; that of the female is brown, or of an ash-grey. The large feathers of the wings and of the tail are white with the males, and black with the females.

What particularly distinguishes these large feathers, and renders them admirably adapted for forming plumes, is that they are soft, open, flexible, that their plumage, composed of detached filaments, without consistence and without cohesion, is long and well filled; and, finally, that the white feathers of the male are capable of taking the most beautiful tinges.

The rarity and dearness of these ostrich feathers, which are brought to us by the Levant trade, would undoubtedly have caused it to be attempted to naturalize this gigantic bird in Europe, if it had been thought capable of thriving any where but in the burning sands of Arabia. But there is another species of ostrich, that of Magellan, which, being a native of the cold countries of South America, might prosper in our climates. It ought to be attempted to bring it hither, and cause it to propagate, in order that we might avail ourselves of its eggs, its flesh, and its feathers.

Whilst awaiting the success that may be hoped from this speculation, there is another which would succeed more speedily and certainly, namely, to multiply the breed of turkeys with white feathers, and to employ for plumes

plumes the feathers which are situated at the sides of the upper part of the legs of these fowls. This supplement to the ostrich feathers would become useful in commerce. We invite the breeders, who occupy themselves with the rearing of this bird, to attend to the profit which such a branch of industry might produce.

Besides the large ostrich feathers which we see wave with such grace over the heads of our ladies, there are others, taken from other birds, which also serve as ornaments in their dress, such as the feathers of the Bird of Paradise, and especially those long and beautiful black feathers which come from the top of the head of the heron, forming an aigrette which rests upon their neck.

Luxury has also applied the feathers of the peacock to the purposes of ornament; the gold and jewels which nature has lavished upon the tail of this superb bird belong to her province; those of the gold-birds, the humming-birds, and others of the large family of peckers, have presented to her the freshness and velvet-softness of flowers, the polish of the most brilliant metals, the lustre of the most precious stones, and the varied and dazzling reflections of the rays of the sun. She has employed in the embellishment of dress the beautiful and brilliant yellow feathers of the throat of the toucan. Nor has she even disdained for this use the azure feathers of the jays, with which he in the fable would not be contented.

Some time ago, such an active warfare was carried on against the birds, in order to procure these feathers, that the husbandmen flattered themselves that they should soon be ridded of them. But unfortunately the feathers of the jay have come out of fashion, and this bird continues to pillage the fields as before.

But it is not only for objects of shew that luxury has employed feathers adorned with the most brilliant colours;

lours; it has also been contrived to render them of some utility.

With the skins, provided with the feathers, of the same birds, to which those of the swan, the duck, the diver, the pheasant, &c. have been added, muffs and tippets, have been made.

What a variety in the natural or artificial colours of these winter ornaments! what softness! what smoothness! what whiteness, in that down of the swan with which the women guard their throats and necks against the cold, and of which their powder-puffs are made.

The skins destined for this purpose, says M. Vieillot, in the new Dictionary of Natural History, ought not to be those of birds which have died of disease, or have been killed in the time of moulting; the feathers would detach themselves, or would not yet have attained to their perfection. We ought therefore to employ only those of birds killed in a healthy state, and skinned a short time after their death, especially in hot weather, otherwise the same effects would be produced by corruption as by disease.

As soon as the skin is cleaned from all the flesh, it is spread out upon a small table, with the plumage downwards, and the feathers well arranged above each other. In order to extend it the better, it is fixed with pins or thread on each side; the fat and flesh which may still remain attached to it are then removed, and if there be any rents in it they are stitched up with silk. The skin is then spread with a paste, prepared with a handful of flour, a little fine common salt, and as much good white wine as is requisite to bring it to a proper consistence.

The skin being thus prepared, it is put to dry in the shade, exposed to the north wind, and when it is dry it is cleaned by scraping, which is easily done, as the paste separates

separates in scales: if after this operation it still retains any moisture, it is again spread with the paste, and put to dry a second time.

When it is quite dry it is fastened with thread upon paper or a ribbon, and, in order to preserve it, it is put into a box, the bottom of which is covered with wormwood or rose-wood. If we wish to give the skins an agreeable smell, we must, before taking them from the board, and after having scraped them, apply to them with a sponge a layer or two of some odoriferous composition.

When the skins are those of large birds, instead of wine, vinegar is used, having salt and alum dissolved in it; of this mixture several layers are given them, the quantity being regulated according to the thickness of the skin.

Writing-Quills.

The quills, for this is the term applied to the feathers of the wings and tails of birds, to distinguish them from the feathers properly so called which cover their bodies; are the longest and strongest of all the feathers. Those of swans, of geese, and of ravens, are employed in preference to all others for domestic purposes; and this according to the qualities which have been discovered in the barrels of each.

Thus the swans' quills are the most esteemed for writing and forming pencils; thus goose-quills, which are more plentiful and almost as good as those of the swan, are more generally employed for writing; thus the quills of the raven are employed more particularly by the harpsichord-makers for quilling the jacks, and by limners for penning drawings.

 Manner

Manner of clarifying the Quills.

The bird which affords the greatest quantity of writing-quills is the goose; a single one may yield them of ten different qualities; but there always remains upon their surface a fatty matter, from which they must be freed, in order to render them pure, transparent, shining, and clean; in a word, to give them the qualities which they ought to possess. This preparation is principally performed by the Dutch. Hence the expression in French, *hollander les plumes*, to denote the operation which the quills are made to undergo. I availed myself of the circumstance of the war, when several apothecaries, instructed in the arts and sciences, were employed in Holland, to solicit them to collect some information respecting this process, hitherto unknown. The following is what they have communicated to me. I wish that by repeating them a satisfactory result may be obtained.

The process consists in plunging the quill, as drawn from the wing of the fowl, into water nearly boiling, letting it soften there sufficiently, compressing it, turning it on its axis with the back of the blade of a knife. This kind of friction, as well as the immersions in the water, having been repeated till the cylinder of the quill is perfectly transparent, and the membrane as well as the kind of greasy matter which cover it entirely removed; it is immersed for the last time, in order to render it perfectly cylindrical, which is effected by means of the fore finger and thumb. It is then put to dry in a moderate temperature.

Feathers and Down for Cushions.

Bolsters, pillows, beds, and cushions, may be filled with the small feathers of the gallinaceous tribe of fowls and pigeons. There are even some provinces in

in which they are already employed for this purpose, but most generally the down of the web-footed fowls is chosen in preference. We should also gladly employ that of the birds of prey, if they were sufficiently numerous to afford an adequate supply of their thick soft plumage.

There are two species of down; the one, which is neglected, consists of light, soft, detached feathers, without cohesion, and curly, which covers many young birds as soon as they are hatched, and falls off as they increase in size; the other, which has more adhesion, and which is collected with great care, is that with short barrels and long, even disunited feathers, which Nature has given as a warm clothing to the birds which fly high in the air and to those which are aquatic, in order to protect them against the cold which they would experience without its aid, the one in the higher regions of the atmosphere, and the others in the contact of the water. This down, with the last, is also covered externally with a close and oily plumage, which entirely preserves them from moisture, and thus enables these birds to preserve their natural heat.

The down of the birds of prey, which is known by the name of *Eiderdown*, being, as we have observed, very rare, means are scarcely thought of for obtaining any other than that of the web-footed fowls, a very numerous class of birds, of which three principal species have been domesticated, namely, the swan, the goose, and the duck.

But before we speak of the manner of collecting the down of these three birds, we must say a few words concerning a down which is much superior to them, for its softness, lightness, and elasticity. This is the Eider-down, furnished by a species of duck which is a native

 of

of Iceland, called the Eider-duck, *Anas mollissima*, Linn. The following account of it I take from Sonnini, the deserving friend of Buffon, and one of the principal authors of the new Dictionary of Natural History.

The Eider-ducks pluck the down from their breasts and bellies to line their nests, and to warm their eggs and their young ones; it is sought for with much assiduity in all the countries where these birds are common; it is the softest, the lightest, the warmest, and the most elastic of all downs. Norway and Iceland yield this valuable substance, which sells there as high as a pistole the pound, when it is well picked and pure.

The nests of the Eider-ducks, in the north of Europe, are to the inhabitants of those coasts a kind of property, the ground of which, though free, is not less constant and sure. Every one enjoys in peace the nests placed upon his ground, and does every thing in his power to attract the couples of eiders thither. A severe fine is inflicted upon whoever kills any of these birds. A single person, especially if his habitation is placed on one of the rocks the most remote from the land, may collect in one year from fifty to a hundred pounds of down. The Danes purchase all that they collect. But it is an universal rule, that the down taken from a dead eider is of an inferior quality to that which it plucks out itself. We have already made this observation, and we add that it is general with respect to all birds.

There is, in fact, an enormous difference between the feathers plucked out of the living animal and those which are taken from it when it has died in consequence of a disease; the latter have very little elasticity, their plumes are caked together by the least moisture; they have also another inconvenience, namely, that, though passed through the stove, the mites attack them much sooner,

sooner, and reduce them to powder in a very short time.

But not only the feathers of domestic birds present this difference, wool and hair are equally subject to it: the wool, shorn from an animal dead of disease, is not by far so much esteemed as that which is taken from a healthy sheep; even the state of the disease considerably depreciates its quality. All the textures made of the hair of an animal that has died of disease have no strength; the dealers therefore are very careful to tell us that their hair comes from a living animal; perhaps the experience of practice teaches them to distinguish it in other ways than by the wear.

The case is the same even with respect to the ivory which is collected accidentally in the countries inhabited by elephants, and that which is taken from an elephant that has just been killed; the latter, which is very easily distinguishable by every turner, is of much greater value, of a finer white, much less brittle, of a better grain, and capable of a more beautiful polish.

Swan's Down or Feathers.

Among the wild swans there are some whose plumage is entirely white, like that of the domestic swans; others, and these are the most numerous, are more grey than white, and this grey when darker appears almost brown upon the head and back.

The domestic swans are plucked, like the geese, twice a year; they afford a down which is esteemed for its softness, and used for filling cushions and beds. It is known that the same substance, which is extremely fine and softer than silk, forms also powder-puffs; likewise beautiful muffs and fur linings, equally elegant and warm, are made of it. The feathers of the wings are preferable

to

to those of the goose, for writing and forming the tubes of pencils.

Duck's Down or Feathers.

Though in some provinces the feathers and down of the gallinaceous fowls and pigeons is not neglected, the web-footted tribe furnish the largest quantity of what is consumed in Europe.

The down of ducks is sufficiently elastic, and is sold at a certain price in Normandy, where large quantities of these fowls are reared. It is made into pillows, beds, &c.

Down or Feathers of Geese.

The common goose, and especially the large kind, which has been domesticated from time immemorial, furnishes the greater part of the feathers and down employed in Europe. The opinion has long been entertained, that it was directly prejudicial to the health of these birds to pluck them; however, the operation being performed before the moulting, this periodical malady, common to the rest of birds, is not followed by any inconveniences, when it is performed at the right time, with skill, and in such a manner as to take away from each wing only four or five feathers and the down.

As soon as the goslings have attained the age of two years, they are conducted several times into clear water; they are then exposed upon a bed of clean straw, in order to dry them, and they are expeditiously plucked for the first time, and a second time at the commencement of the autumn, but with moderation, on account of the approach of the cold weather, which might incommode them.

Another precaution, which ought always to be observed, is that, when the geese have been recently plucked, they must be prevented from going to the water,

water, and confined to drinking for a day or two, till their skin has become hardened; finally, they are plucked a third time, when, after having been fattened, they are killed. Thus this bird, which has lived about nine months, may furnish during its life three crops of feathers.

The profit which may be derived from the feathers of geese is by no means to be contemned; they form an important article of commerce in the county of Lincoln, in England, both in down and writing-quills.

It would therefore be throwing away very unnecessarily a certain and considerable profit which may be obtained from a numerous flock of geese, to neglect gathering once, twice, or thrice a year, a crop of quills for writing, and of down for pillows and beds. It has been estimated that this product varies according to the age of the fowl, and that an old goose commonly yields her pound of feathers, whilst a young one pretty constantly affords half a pound.

The geese destined for the farm-yard, and which are what are termed the old geese, may, it is true, be plucked without inconvenience three times a year, at intervals of seven weeks; but the goslings must be suffered to attain the age of thirteen or fourteen weeks before this operation is performed upon them, especially those which are intended to be eaten early, as they would grow lean, and be deteriorated in quality.

The nature of the nourishment contributes very essentially to the value of the down and the strength of the feathers; the particular care which is bestowed upon the geese has no less influence upon them. It has been observed, that in places where these fowls find plenty of water they are not so subject to vermin, and that they afford feathers of a better quality.

There

There is a kind of maturity with respect to the down, which is easy to be distinguished; it is when it begins to fall spontaneously; if it be plucked too soon it does not keep, and the worms get into it. Lean geese furnish more of it, and that of better quality, than the fat ones. The farmers ought never to suffer the feathers of the geese to be plucked some time after they are dead in order to sell them; they generally have a musty smell, and cake together. None ought to be introduced into commerce except such feathers as have been plucked from live geese, or those that have just been killed; in the latter case they ought to be plucked without delay, and, if the operation can be completed before the fowl has become quite cold, the feathers will be infinitely the better for it. It is also the custom to turn their feet behind their backs, so as to support their wings, without which they would break, and the geese would be no longer saleable.

Drying of the Feathers.

Whatever may be the species of birds that furnish feathers in the greatest abundance, those which are the most esteemed ought to be plucked from the living animal, and it is easy to distinguish them by the circumstance, that their tubes, when pressed between the fingers, give out a bloody juice. Those which have been plucked after death are dry, light, and subject to be attacked by the worms and mites; but the feathers and down of the best quality, gathered before the moulting, and at the proper season, require, as we have already observed, precautions, in order to preserve them in a good condition. They always carry with them a fatty and watery matter, which, by the changes which it must undergo, would com-

communicate to them an extremely disagreeable smell. They must therefore be previously dried, put into an oven after the bread has been taken out; and it will be proper even to carry this desiccation to a greater length with the plumes of aquatic birds, on account of their very oily nature.

When this preliminary desiccation has been performed, the feathers are conveyed into a dry and ventilated place; they are turned every day, and by this means the marrow contained within their barrells is dried; the fatty and membranous parts of their surface are dissipated in the form of powder; and then the feathers may be kept for ages; but if these precautions are neglected, if the feathers are not reduced to the state of pure dry substance; if they contain juices half dried, they will then become a prey to insects; in this case they must be cleansed in soap-water, and afterwards washed in several waters, an operation which impairs the elastic quality of the feathers and occasions loss.

What we have said of feathers is applicable also to wool: if it has been badly purified, the fatty matters with which it is impregnated attract the insects, and it must then be washed in order to prevent the destruction of the whole, and to deprive it of that natural grease which corrupts it.

On account of the uncertainty in which we are with respect to the choice of the original substances that have been employed in the beds of a country house, we ought to place them upon a frame supported by poles in the middle of a large place well ventilated, to turn and beat them from time to time, to expose them frequently to the open air, in the cold of fine winter days, and in the sun at the commencement of spring, in order to keep

them free from that species of insect, of the class of the phalenæ, which is propagated only in darkness and repose. The open air and agitation are means infinitely preferable to those aromatic plants which have been proposed with the view to produce this effect.

The purifying process consists in putting into three pints of boiling water a pound and a half of alum, and as much cream of tartar, diluted with twenty-three pints more of cold water; in which the wool is let soak for some days, after which it is washed and dried; it is then no longer subject to insects.

The purity of the feathers and wool, which are used for making mattrasses and cushions, ought undoubtedly to be considered as an object of the utmost importance to health. The animal efluvia may, in a number of circumstances, prove prejudicial to health; but the danger is still much greater when the wool is impregnated with the sweat and excrementitious matters of persons labouring under putrid and contagious diseases. Too much care can therefore not be bestowed upon beating, carding, cleaning the wool, and washing the cloth of mattrasses. This is a precaution which ought to be taken every year by the careful housewife; and we earnestly recommend it to her, for the sake of the preservation of her family, and the interest of the domestic concerns, the conduct of which falls to her province.

Pyrotechnic

Pyrotechnic Observations, and their Application to Evaporatory Furnaces. By M. CURAUDAU.*

With an Engraving.

From the ANNALES DE CHIMIE.

SINCE I published my observations on the causes of the imperfection of the evaporatory furnaces, I have had occasion to make new ones upon the same subject, the application of which must tend to increase the advantages of the construction which I have pointed out.

In my first memoir * I shewed that the bottom of the boiler in the evaporatory furnaces not only opposed the elevation of the temperature, but that it also diminished the activity of the fire, which rather promoted the gazification of the combustible body than its oxygenation. I mentioned the Argand's lamps, and their glass tubes, to prove the necessity of elevating the temperature about the combustible substance, whenever we wish to have a complete and energetic combustion. At present it will be the enameller's lamp that shall serve me as the example upon which I shall rest my new observation; and I confess that it is to the examination of the effects which it produces that I owe those which it has given me occasion to make. In fact, if we examine the jet of flame of the enameller's lamp, we shall see that the intensity of its action depends upon the current of air which is directed upon the flame of the wick; we shall likewise see that it is only at the extremity of its jet that the greatest energy of the calorific rays resides, the intensity of which is such, that by means of this lamp we may obtain effects comparatively as powerful as those which would be obtained in our best furnaces.

* Inserted in the fourth volume of the present series of this work, page 383.

This

This mode of action of the caloric proves that we may augment its effects by augmenting the rapidity of its current, and directing it properly towards the bodies to be heated. Such are the conditions which I have endeavoured to unite in my new construction, and which, after the application I have made of them, will serve to support an opinion which required the test of experiment upon a large scale, in order not to be classed among mere hypotheses.

Latterly, having been consulted upon the construction of a maltster's furnace, I availed myself of this circumstance in order to demonstrate the great advantages of the changes which my observations had appeared to me to render necessary in it, and to engage the proprietor to construct his furnace according to the plan which I sent him.

The following is the result of experiments made in order to ascertain the advantages which the new-constructed furnace has over that in the place of which it has been substituted.

The old furnace, to raise 2,500 litres of water to 50 degrees of Reaumur's thermometer, required two hours and a quarter, and it consumed, in an operation which is repeated every day, 625 kilogrammes of new dry wood.

The present furnace, on the contrary, consumes in the same operation only 450 kilogrammes of wood, and takes only an hour to raise 2,500 litres of water to 50 degrees of temperature; whence it results, that this new construction evidently produces a saving of time of $\frac{7}{21}$, and of fuel to the amount of nearly a third.

Such advantages have appeared to me sufficiently important to merit being generally known, and to render it desirable

desirable that a new method, which may have the greatest influence upon the saving of the fuel necessary for the manufactures, may be carried into practice.

Description of the Furnace.

(See Plate VIII.)

A, Fig. 5, door of the fire-place; it is 40 centimeters broad and 35 high.

B. This part of the furnace represents a vault; it is 55 centimeters in height, 80 in breadth, and one metre 50 centimeters in depth. To add to the effect which the heat ought to produce, I give to the middle of the fire-place a depth of 50 millimeters more than to the extremities, which renders this part sensibly concave.

C, an aperture made in the middle of the vault, and destined to augment the velocity and the action of the calorific rays; it has 15 centimeters in height, which is equal to the thickness of the vault. This aperture, at its lower part, is 60 centimeters long and 45 broad: at its upper part it is 50 centimeters long and 35 broad, which gives to each extremity of the aperture the form of a spheroid, the largest axis of which is in the direction of the length of the vault.

D. The distance from the boiler to the mouth of heat is 15 centimeters at the middle, and reduces itself to 10 at the angle E, which produces the advantage of confining the incandescent rays in proportion as they lose their intensity by expansion.

From the angle E to F the distance is 2 decimeters; the int[illegible]nt angle F is 6 centimeters distant from the boiler, and the saliant one only 3.

G and H are angles similar to those of F, but only 3 decimeters distant from each other: these angles may be multiplied according to the height of the boiler. The advantage which they produce is to cause the calorific rays to undergo several refractions, which augments their energy at the place of their deviation.

I, is an aperture communicating with the chimney; it is 7 decimeters wide and 15 centimeters high. At the angle H, the half of the circumference of the furnace ought to be closed by a range of bricks, in order to compel the heat to direct itself from the opposite side of the chimney; immediately above this range of bricks, those which follow ought to be 10 centimeters distant from the boiler, and to be continued thus to the height of 10 centimeters: then each range of bricks are brought nearer together, in such a manner that this conduit of heat is closed at the height of 15 centimeters, which is then done over the whole circumference of the boiler.

K, is the orifice of the chimney; it ought to have, in its whole height, three square decimeters, and at least four meters in height.

L, represents a slider of wrought-iron; it is a meter above the boiler; it serves to open or close the chimney at pleasure.

The proportions laid down in this plan suppose a boiler one meter thirty centimeters wide at the lower part, and a meter in height.

Inquiries respecting the tinning of Copper, Pewter, and Pottery. By M. Proust.

(Continued from Page 140.)

The more complicated the processes employed in the arts are, and the dearer the agents to which they are to be subjected, the more means they present to the dishonest workman for raising the price of the articles which he manufactures. The tinning, which costs at present about four reals, would cost at least ten, if that which has been thought capable of being substituted in its place had been practicable, since the latter is the product of three operations, namely, the first and the second bath, and the hammering in order to smooth it, and of the employment of two substances, the sal ammoniac and charcoal in larger quantity, and also of much more time.

The proportions of one part and a half of zinc to one of tin, indicated by M. Buschaendorf, already gave reason for very well-grounded doubts on the first part of such a tinning. However little the other parts of the prescription, when subjected to an examination founded upon a knowledge of the arts, might have given rise to the same doubts, it would have been perceived, that the experiments of the author, though perhaps successful upon the small articles executed by able hands, were nevertheless not described in such a manner that one could be assured of success in operating upon a large scale. It would, in my opinion, have been proper first to confirm the experiments by application to the utensils of a hospital, or other large establishment, at Leipzic, and to ascertain the advantages of this tinning by authentic testimonies, before announcing it to all Europe.

I caused

I caused to be tinned before my own eyes, and in presence of a pretty considerable number of witnesses, pieces of different sizes, first with fine tin, and afterwards with the alloy proposed; but whatever might be the ability of the workmen who laboured in these operations, none of them were able to apply the second bath in a satisfactory manner. The larger the diameter of the pieces was, the less successful were the results. Two workmen succeeded each in tinning a pan of eight or nine inches diameter; but the same workmen had no success with those of fifteen or sixteen inches diameter, with pieces of copper of a foot and a half in width, in their lids, in small alembics, in tea and chocolate pots. None of them chose to undertake the tinning of a copper cullender, only eight or nine inches in diameter.

A foreigner, who gave out that he was capable of solving the most difficult problems in his art, was not more successful than those who had preceded him, and he could not find either in his boasting, or in the privileged instruments with which he was provided for this purpose, the means of tinning a common chocolate-pot.

There are in all countries artisans who have no settled place of abode, who regard neither honesty nor the laws of the state, and who are always ready to derive from their craft the means of sacrificing the interests of a whole nation to the most paltry present emolument.

Of such, several presented themselves during the different experiments which were made for the purpose in question, whose services were offered rather with a view to elude than to resolve the problem, in order that thus the wise intentions of government might be confounded with their perfidious projects. But the authority which presided, in concurrence with science, over experiments

upon

upon which the public safety depended, disconcerted, with marks of indignation, such odious machinations.

To throw a quantity of the alloy prescribed into a bath of tin, in order to immerse it in it without dissolving it, and to incorporate it with that tin, as a quantity of sand may be thrown into melted fat, was to resolve the problem only for the purpose of over-reaching the probity of the judges.

In an utensil of copper, the effects of which are dreaded, it is necessary that a barrier should be placed between the metal and the aliments which are prepared in it, and this barrier is the tin. But if it be possible to reinforce it still by a second metal which shall augment the interval which must always be interposed between the copper and the aliments, it is certain that we shall then be able to remove all dangers, and dissipate all apprehensions. The intention of M. Buschaendorf was to cover the first tinning with a second of a more insoluble and more durable kind; but this author was very far from approving of the difficulties of his prescription being eluded by insiduous manœuvres which should frustrate our hopes, and which, without adding any thing to the present method of tinning, should serve only to disguise the truth in the eyes of persons who are not acquainted with the arts.

If the processes of the author have not proved successful among us, he has not the less claim to the esteem and gratitude of the public. We ought never to discourage those who labour to render themselves useful, but rather to aid them in surmounting the obstacles which oppose themselves to their zeal. Let us then rather endeavour, by expressing our sentiments of gratitude, to induce this author to seek out some alloy more proper for tinning, and better adapted for answering the wishes of society.

It is well known that the tinning which has succeeded well in small articles with the aid of an excess of tin, which remained in the pan after the first bath, does not present in its second layer an uniform solution of the zinc in the tin. It is true, that a very small portion of zinc was dissolved in the tin; but the surplus was only a mechanical incorporation of some grains which might be reckoned by the mere aspect, and which were distinguished by the touch, by the asperities with which the pan was covered; which cannot be better compared than to a portion of sand incorporated with fat, with which one should offer to varnish a table, under the pretence that the sand is intended to harden the fat, and render the varnish solid. Such were the ideas to which this tinning gave rise among the disinterested persons, to whose examination it was subjected.

These same insulated grains of zinc have obliged the author to recommend flattening them down with the hammer, and as they subsist here equally, even after the application of the remedy indicated, they have not permitted this troublesome addition of labour to be dispensed with.

The zinc, in the application of its alloy, not only experiences a kind of separation which appears to be the result of a crystallization in the midst of the tin, which is more fusible, but it also is burnt or oxydated rapidly as soon as we endeavour to extend it over large surfaces, being transformed into a black scoria of the same nature as that which remained, as I have remarked, in the iron spoon, after the trials made for obtaining vessels of this alloy. This scoria, which cannot be reduced by resin, and which resembles that which Hellot and Geoffroy saw, destroys the tinning in such a manner, that nothing remains to be done than to have the piece scraped afresh, and new tinned.

If

If artisans experienced in their art have not been able to get the better of these difficulties; if they have themselves declared that the success of one small article to ten which were spoilt was not to be attributed to their skill, but to certain circumstances which they could not command or determine, how should these men be able to adopt processes which would continually expose them to the necessity of recommencing, at their own expence, the tinning of the articles which were intrusted to them? Let us therefore leave far from the workshops science and its theories; and let the operations which they teach or improve be always of easy execution, as being to be practised by persons whose destiny it is, not to meditate upon them, but only to derive from them their means of subsistence.

On glazed Pottery.

When a clay is pure, white, and without any considerable mixture of oxyde of iron and sand, it may be fit for the fabrication of vessels of such a degree of hardness as to strike fire with the steel, after being baked; but clays of so excellent a quality are but rare. The Dutch possess such clays, and they make of them those oblong, round, and square flasks, in which they send us beer and other commodities. The quality of this clay is such, that the vessels made of them preserve the liquors as well as crystal bottles; and these vessels are besides improved by means of a glazing, of which I shall shortly speak.

The English likewise possess clays of the same quality. We also meet with at Madrid, though rarely at present, plates and cups of a potter's-ware of this kind, which strikes fire with the steel. They are glazed with the vapour of sea-salt, which is thrown into the oven when the pottery is baked. These vessels, which are so valuable

in chemical laboratories on account of the resistance which they oppose to the acids, are however very heavy; their baking requires a great quantity of fuel, and their fabrication, on this account, becomes daily more rare.

In France they have also a clay which possesses something of this quality, or which at least they apply to the same purposes: I mean that of Savigny, in the province of Picardy, where it is termed *grès*, a word undoubtedly derived from *greda*, which is employed like many others which belong to the Spanish language *.

This pottery, without being as white or as fine as that of the Dutch and the old English pottery, answers nevertheless the same purpose to a great part of France. It is as hard as a pebble; it has scarcely any pores in select pieces; wine, vinegar, and oil, keep in it perfectly well; but the great consumption of fuel which it occasions renders the baking of it very expensive.

These three sorts of pottery would not be sufficient for our different domestic purposes, since they are too dense, of too solid a paste, and very liable to crack in the fire; they cannot therefore be employed for making boiling-pots, saucepans, &c.

The sandy clays, and even the calcareous ones, or, in other words, the marles, merit the preference for this purpose. Baked by fire, they become porous, in such a manner that they can, without breaking, endure the alternate action of fire and of water; however, they always crack more or less by use.

* M. Proust surely does not mean to say that there is no clay in France besides that of Savigny which can be baked into *grès* (stoneware). Macquer mentions many others; we know at present some very white ones which have this property, and we must rank in this class all those which are employed in the different departments in the fabrication of glass-maker's crucibles. Note of the French editor.

But

But if this pottery has the advantage of being able to bear the fire, it has, on the other hand, the demerit of suffering the liquids to transude by reason of its porosity. This defect it has been necessary to remedy by layers of glazings of different kinds.

There are, however, some kinds of pottery, the paste of which retains a sufficient degree of adhesion in all its parts, not to require this additional varnish, which is extremely useful to the countries where they are fabricated. Such are the pots of Zamora. I have already spoken of a glazing which is formed of the substance of the pottery itself, by means of salt, which, when thrown into the oven, is reduced into vapours.

Another glazing is also obtained from the surface of the article, by covering it for this purpose with lead previously oxydated, or with sulphuret of lead, which comes to the same thing, since the heat of the oven dissipates the sulphur, and promotes the oxydation of the lead which remains upon the surface. This oxyde dissolves the sandy particles which it meets with, and uniting with them it assumes the transparency of glass, which it could not receive by itself, and thus the vessel is glazed.

Among all the known productions with which commerce furnishes the arts, there is none which can afford this varnish at so advantageous a rate as the oxyde of lead. The use of the salts would be too expensive to afford pottery which should be within the reach of the indigent class of society.

If we wish to give to the pottery a more brilliant glazing, and which shall conceal the porosities, and the disagreeable colours which it acquires in the first baking, we must compose a glazing for the express purpose, the basis of which is always the oxyde of lead, to which a little sand is added, in order to give it the vitreous qua-

lity

lity which it must no longer derive from the surface of the vessels, and mix with these two ingredients oxyde of tin, which has the property of giving a milky whiteness to the glass of oxyde of lead and sand. This glazing, when well vitrified, and adhering well to the biscuit, transforms it into what is termed *Talavera* *. This is a branch of industry which has fallen into decay in the hands of a nation which formerly surpassed all others, both in this and in many other branches.

But what is the Talavera of the present day compared with some specimens which we still meet with in different places, some remains, such as flower-pots, which have supported, for more than a century, cold and heat, frost and moisture, without a single crack being yet discernable in them? Who will now exhibit upon his table a piece of the Talavera which is manufactured at the present day?

When the clay is of good quality, and preserves its whiteness after the baking, it is kneaded with a portion of calcined and ground silex, for the double purpose of rendering it porous and making it present to the varnish which it is to receive, the sandy points of support, which must produce its adhesion with the clay, and which this earth would not have if it were pure.

The glazing is then composed simply of sand and oxyde of lead. This mixture is previously fused, in order that the ingredients may be reciprocally saturated and incorporated, in such a manner that neither of them may any longer be able to obey the attraction which before might attack and dissolve them. It is afterwards applied, baked, and vitrified, upon the surface of the ves-

* A town in Spain, where this kind of pottery is manufactured, and which has given it its name.

sel,

sel, with such solidity, that no acid can separate from this glazing the oxyde which it contains.

And what difference is there between the pottery of Alcoron and the finest English pottery?

On the one hand, the choice of the clays, and on the other, the same ingredients for the varnish; the oxyde, the dangerous oxyde of lead and the sand, better incorporated, vitrefied, saturated by one another, and, finally, neutralized by their respective attraction, in such a manner that the oxyde of lead cannot obey, as it readily does in its pure state, the solvent action of vinegar, wine, lemons, verjuice, &c. In order to insure the salubrity of these glazings, every thing depends upon applying a greater heat to the pottery, so that the oxyde of lead may be able to dissolve a larger quantity of the sandy part of the surfaces; a solution which it cannot effectuate without a proper degree of heat.

In cases where these surfaces do not afford the sandy parts which the oxyde of lead requires, it is supplied by mixing ground-sand with sulphuret of lead. This is a means whereby the pernicious qualities of this oxyde may be annihilated throughout all Europe. In order to perfect these kinds of pottery, it is not necessary to purchase any secret or particular process; it is not even necessary to watch over the operation. Let the purchase of the fuel be facilitated to the manufacturers, and they will soon know how to bring to perfection what intriguing arts, suggested by interested motives, would wish to make appear very difficult. A manufacturer of this city (Don Esteban Cantelar) has presented to me several specimens of an improved pottery, which have appeared to me to combine all the advantages which are to be desired; of which I have given him my attestation. What is then the cause which could deprive

deprive the public of the advantages which they might expect from this useful amelioration? We employ daily, with the greatest security, both for drinking and eating out of, vessels composed of lead. The crystal which sparkles upon our tables is composed of it, and the English pottery is glazed only with its oxyde. This oxyde constitutes a part of the covering of our pottery. And why might it not, with equal safety to health, constitute a part of that of the common pottery?

But woe to him who should keep vinegar, wine, and preparations of alimentary or medicinal acids in glazed vessels, the oxyde of which had not been saturated with sand. It is but too true, that it merits the anathema which the most learned physicians of Europe, and among us Dr. Luzuriaga, have fulminated against this oxyde. It introduces itself into vinegar, into lemon-juice, into verjuice, and into the syrups which are made with them, without being perceived.

I have examined verjuice from thirteen different houses in Madrid, and have found only three of them free from any indications of poison, which proved to me that the ten other verjuices had been prepared in Alcorcon vessels. It is true, that none of these verjuices contained a sufficient quantity of lead to raise suspicions in those who might have tasted them. Were that the case, we should have been obliged to give particular directions, instead of the general ones which this essay contains. But as it is of the greatest consequence that those persons who make a trade of preparing acid juices should take the strictest precautions that lead may not, unknown to them, introduce itself into those preparations, I think that they ought to substitute, in the place of the Alcorcon ware, small wooden tubs, or vessels of fine tin, which combine the advantage of cleanliness with that of durability,

bility, so as amply to compensate for the additional expense of the original purchase.

But as to what respects the preservation of vinegar in the large way, I think that it would be safest to employ for this purpose the same vessels which are used for wine, namely, those of Toboso, and that for the following reasons.

The jars, whose glazing appears to be the most perfect, do not receive in the oven a sufficiently equal and distributed heat with that degree of precision which would be necessary in order that the vitrification should be the same at all points. It is therefore rare that a vessel of this magnitude can have, in this respect, the same uniformity and perfection which we obtain in the smaller vessels. It is therefore to be apprehended, that the vinegar, which penetrates so easily into the cracks of the glazing, may dissolve the portions of oxyde which are not combined, or but very little so, with the sand.

It is also known that the glass of which wine-bottles are made, though the ingredients of which they are composed are better combined, does not resist the acids to such a degree as not to be exposed to corrosion, and even to solution in length of time *. But what is more remarkable, is, that the weakest acids are those which most easily open themselves a passage into these vitreous compositions. Of this the history of chemistry affords us many examples: I shall therefore not advise any one to keep vinegar in glazed jars when he can substitute in place of them other vessels, the salubrity of which is ascertained.

* This happens only when the composition of the glass has been surcharged with lime or oxyde of iron, in order to facilitate its fusion. Note of the French editor.

TO BE CONCLUDED IN OUR NEXT.

Extract of a Memoir of M. Payssé, *principal Apothecary to the Camp at Utrecht, on the Preparation of some of the Oxydes of Mercury in the large way.*

By M. Parmentier.

(Concluded from Page 156.)

Red Oxyde of Mercury by the Nitric Acid.

THIS oxyde, so generally known in commerce by its brilliancy and its beautiful colour, was also one of the preparations which M. Payssé had the curiosity to see performed in Holland, in order to ascertain the means which the manufacturers employ in order to obtain it of a brilliant redness and crystalline appearance, similar, in a word, to that which is manufactured in Germany, and is brought to us, particularly from Nuremberg, from Frankfort, from Basle in Switzerland, and from Triest.

All works of chemistry indicate to us processes for preparing this oxyde; but very few agree respecting the means of obtaining it of a lively and brilliant red. Some, after having effected the solution of the mercury in nitric acid, evaporate it, and expose the matter to a pretty violent fire for some hours, in order to decompose the mercury and convert it into red oxyde; others re-cohobate a certain quantity of nitric acid upon the first solution, dried, and distilled. By repeating this operation several times, M. Chaptal obtained very beautiful crystallized red precipitate *; others, finally, after having dried the nitrate of mercury, incorporate with it a new quantity of running mercury, expose the mixture, well made, to a brisk heat, of an obscure redness, between two crucibles, luted together; and in this manner M. Van Mons

* See his Elements of Chemistry, article Mercury.

asserts

asserts that he has very easily obtained the red oxyde of mercury perfectly crystallized *.

All these processes, though accurately described, are not however sufficient to the person who should wish to perform the operations upon a large scale, or to make the application of chemistry to the arts which depend upon it. It requires the experience of the large work-shops, the habit of the operations of great laboratories; otherwise one does not succeed till after having made many frequently ruinous and discouraging trials.

M. Payssé has frequently employed in his experiments the different methods of which we have just spoken; he has proceeded with all the accuracy to which the desire of succeeding in such an operation gave rise, yet he never obtained results so satisfactory as he hoped; he adds, however, that the means proposed by M. Chaptal were those from which he obtained the most constant success, although it was not complete. He varied his processes by employing the nitric acid in different proportions, and also of very different degrees of density and purity; but it was never possible for him, notwithstanding the quantity of crystallized oxyde which he obtained, to account very accurately to himself for the phenomena which cause so many variations in the results of this operation, which in appearance is so simple, and which nevertheless cannot be executed without many difficulties. It requires so much care and management in the application of the heat which one is obliged to employ, that in two operations, in which every thing was disposed in the same manner, in which all the circumstances appeared entirely

* Journal de Physique and de Chimie, de Van Mons; Memoirs by Messrs. Fischet and Lichtenberg, Pluvoise 15, year 10, page 211, and Brumaire 15, year 12, p. 178.

 similar,

similar, his results were almost always different. Sometimes one of the apparatus contained a portion of crystallized oxyde, whilst the other part was a brick-red powder, without brilliancy; sometimes the whole of the oxyde of one of the vessels was converted into fine crystalline precipitate (red oxyde of mercury), and that of the neighbouring vessel, which had been treated in the same manner, presented only a mass, half yellow and half red, without appearance of crystallization; sometimes the two apparatus presented only this oxyde converted in part into brilliant oxyde, whilst the rest was of a disagreeable red; finally, sometimes, the one contained this oxyde, presenting three very distinct colours, the bright red, the red inclining to the brown, and the orange.

The second apparatus presented only an oxyde with two very distinct colours, the orange and the brick-red, without brilliancy. Where, says M. Payssé, shall we look for the cause of these anomalies, if it is not in the manner of evaporating the solution, and especially that of decomposing the metallic nitrate during the whole course of the operation? We shall, however, see that the purity of the nitric acid contributes also very considerably to render difficult the conversion of the mercury into crystallized red oxyde, and that the muriatic acid with which the former is constantly mixed in that of commerce, presents a powerful obstacle when it exists in it in too large proportions.

When mercury is dissolved in nitric acid mixed with muriatic acid, there is almost always formed a white precipitate, which is the more abundant in proportion as the quantity of the latter acid is larger. Without stopping now to determine the real nature of this precipitate, M. Payssé considers merely the part which this compound acts in the oxydation which it is endeavoured to make

mercury

mercury undergo, by decomposing the nitrate of this base by the action of fire.

If we expose to fire nitrate of mercury obtained from a solution of this metal in the nitric acid, mixed with muriatic acid, this salt first loses its water of crystallization; it is afterwards decomposed, letting escape a portion of acid which existed in it in excess, and which may be collected in a convenient apparatus, since it has experienced no alteration: to this disengagement succeeds that of the gaseous nitrous acid, which manifests itself by very elastic red vapours. This acid gas is almost always mixed with oxyde of azote, or else this follows the disengagement of the former. These two gasses indicate the decomposition of the nitric acid, and the loss in favour of the mercury of the oxygene which causes the nitric to pass into the state of nitrous or of oxyde of azote. When the application of the fire is continued, the last portions of the nitric acid abandon the mercury, and this is converted into an oxyde more or less saturated with oxygene, because in fact this state is always dependant upon the quantity of caloric which is accumulated upon this substance during its transition into that of red oxyde.

It is when the vapours of nitrous gas cease, that the oxyde changes colour; it passes successively from the white to the yellow, and from the orange to the red, more or less intense. It is commonly when the red is very vivid and beautiful that the vessel is removed from the fire, and the mass is preserved either in that state or reduced into powder.

It seems, at first sight, that an operation, conducted as has just been indicated, ought to give, as its constant product, a well crystallized oxyde; and this in fact happens, 1, when the nitric acid is free from muriatic acid, or when this exists in it in very small quantity; 2, when its

its density is equal to thirty-four and thirty-eight degrees ; 3, when the desiccation and the decomposition of the metallic nitrate are effected slowly, and in an uniform manner ; 4, when the heat applied towards the end of the operation, and whilst the last portions of acid are disengaged, has been well graduated, and kept always nearly at the same degree ; for if, as many practitioners are in the habit of doing, and as sometimes has happened to M. Payssé, we heat the oxyde too rapidly at the moment when it acquires its fine colour, as well as its brilliancy, it not only loses its crystalline appearance, but it also assumes a disagreeable brown-red tinge ; nay even, if this application of heat were carried farther, it would at least be disoxygenated partially, if not completely, and the mercury in this case would resume its original form, as the author has had occasion to observe under various circumstances.

If the quantity of muriatic acid with which the nitric acid is mixed is too considerable, and amounts to several hundredths of the dose employed, the peculiar compound which results from its union with the oxyde of mercury assumes not the characters of a simple super-oxygenated muriate, as might at first be presumed, but those of a new compound, which dissolves only in very small quantity in water (and even then the water must be boiling), which sublimes by itself in close vessels, assuming, or rather retaining, its peculiar colour, which is a brownish red, without appearance of crystallization, and which M. Payssé considers as a muriate of mercury with excess of oxyde, according to the results which it has given him when subjected to some experiments.

When this compound exists in too large a proportion in the oxyde of mercury which is prepared, it always opposes the formation of the crystallized red oxyde, as he

he has remarked a great many times in his experiments; if, on the contrary, it is contained in it only in a small proportion, it may be neglected, nay, it even separates itself from the rest of the oxyde in the vessel in which it is prepared, occupying a line, and forming a detached stratum towards the upper part of the mercurial mass.

What M. Payssé has shewn relative to the advantage which arises in the preparation of the red oxyde of mercury by the nitric acid, from employing an acid as free as possible from muriatic acid, he had remarked in the experiments which he made every year in his course of chemistry; but not being able to rest a very just opinion upon the results of some trials made on a small scale, he wished, previous to developing it, to observe with attention what passes in the great operations which are practised in the manufactories, where considerable masses are acted upon at the same time. Now that all his doubts on this subject are removed; and as he is acquainted with the phenomena which take place when several hundred kilogrammes of mercurial oxyde are treated in one operation; the quality of the nitric acid that is employed, and the method to be followed in the application of the heat, during the whole course of the operation, the author is able with certainty to indicate a process for obtaining this oxyde possessed of all the qualities which are desired and esteemed in these preparations.

Take mercury, exempt from all other metallic matter, 50 kilogrammes; nitric acid, deprived as much as possible of muriatic acid *, indicating by the areometer for acids

* It may be tried by the nitrate of silver, and if the quantity of muriatic acid appears small, it may be neglected. However it sometimes happens, especially when the nitric acid is too weak, or when it is not in

acids from 34 to 38 degrees, 70 kilogrammes; dissolve the metal in the acid, and aid their reciprocal action by a gentle heat in the sand-bath *; evaporate by distillation; remove the recipient from the retort when the vapours of the nitrous gas begin to manifest themselves; they announce the decomposition of the mercurial nitrate. It is here that we must make use of a constant and moderated temperature, if we wish to ensure the success of the operation; it is raised a little towards the end, that is to say, when the disengagement of the gazeous nitrous acid manifests itself only in a little sensible manner; the vessel must be kept at this degree of heat till it is perceived that the mass of mercurial oxyde is of a lively and brilliant red in all its parts. An application of fire for eight hours

in sufficient quantity, that the mercury precipitates itself in the state of white oxyde as fast as it is formed, because it cannot be held in solution either by the water or by the remaining acid; besides which, the non-oxydated mercury continually exerts a chemical attraction upon one of the principles of the acid, and the latter tends rather to be decomposed than to dissolve the mercury which is already saturated with oxygene to a certain point; so that we must take care not to confound this property with that of the muriatic acid: moreover the precipitate, which is only the effect of the oxydation of the mercury, dissolves entirely in the heated nitric acid, whilst the other can dissolve in it only in very small quantity; this property alone would be sufficient to distinguish it. I might have dispensed with making this observation, since in my process I require a highly-concentrated and very pure acid; but as it frequently happens that one has not one so strong, we may then supply it by the quantity, and my remark in this case will not be superfluous. (Note of M. Payssé.)

* This solution ought to be made in a retort of glass, with a wide bottom. This vessel is preferable to the mattrass which is used in Holland, as it is only required to adopt a recipient to it, and to distil, in order to collect the acid which is not decomposed upon the metal. This object is by no means to be neglected in operations on a large scale. (Note of M. Payssé.)

hours is generally sufficient for 200 kilogrammes of this substance.

It has been observed elsewhere, that the turf which is used in the manufactories of this country presents some advantages over other combustibles; and this is true, for we may easily obtain an equal heat, because this matter burns slowly, and in a very uniform manner.

As the charcoal of wood, or that which is found in the earth, are the two combustibles which are employed the most frequently in France, none of the circumstances of which we have spoken ought to be neglected.

When all the precautions indicated have been vigorously observed, it is rare that we do not succeed in obtaining oxyde of mercury by the nitric acid, of a brilliant redness and well crystallized.

If, notwithstanding all the care that has been taken, the mercurial mass should not have the proper brilliancy, or should not present the crystalline aspect which is required, it would then be necessary to reduce it into coarse powder, to introduce it into a new glass vessel, into which some cubic centimeters of nitric acid had previously been put, only in order that we might be able slightly to impregnate, by heating in the sand-bath, all the not brilliant oxyde. One or two hours application of fire with this apparatus would then be sufficient for converting the oxyde into crystallized precipitate.

On reviewing what has just been said respecting the method of preparing the red oxyde of mercury by the nitric acid, we see that the conditions, indispensably necessary for obtaining it constantly brilliant and crystallized, are,

1. To make choice of a nitric acid free from mixture with muriatic acid; 2, to employ this acid at the degree of concentration already indicated; 3, to evaporate the metallic

metallic solution with a moderated heat; 4, to employ a vessel with a bottom sufficiently wide for the mass of oxydated mercury to present much surface, and to be easily heated in an equal manner in all points at the same time, in order that the nitrate may be uniformly decomposed, and pass as speedily as possible into the state of red oxyde; 5, to augment the heat gradually, and in proportion as the decomposition of the nitrate advances; 6, to sustain this temperature at the same degree during the whole time that the operation lasts, that is to say, the transition of the yellow oxyde into the red which is required.

"I am very far from believing," says M. Payssé, "after my experiments, and those which I have seen performed in the large way, that the crystallized red oxyde of mercury owes its brilliant appearance to a state of semi-vitrification, as M. Van Mons thinks *; for if this oxyde were really semi-vitrified by this operation, it would follow that a more elevated temperature would be capable, nay must necessarily convert it into glass; but nothing of the kind ever happens; for I have heated very strongly, and at several times, four grammes of this oxyde well crystallized, in two crucibles luted together, when, instead of being vitrified, it lost not only its brilliancy, but also its fine red hue, and acquired a disagreeable brick colour. When a still stronger heat had been applied, a great part was found reduced, and the rest of the oxyde had acquired a deep brown colour.

"I am however aware, that there are bodies which are not susceptible of passing into a complete vitrification, and which nevertheless experience, at a certain degree of heat, a pastey fusion, which is called semi-vitriform;

* Journal de Physique de Chimie, years 10 and 12, pp. 178 and 211.

but

but when the oxyde of mercury is heated in transparent vessels, nothing of the kind is seen to take place, we do not perceive the least trace of a partial or general softening of the mass; besides, I have strong grounds to believe, that the crystalline state of the mercury, oxydated by the nitric acid, is owing merely to the degree of oxygenation of this metal, and to the uniform manner in which the oxydating principle combines with the mercury during the decomposition of the nitrate of this base, and its conversion into red oxyde."

The experiments upon this substance not being yet terminated, M. Payssé has promised to continue them, and to send me the results without delay, which I shall consider it equally a duty and a pleasure to communicate to the public through the medium of this journal.

Intelligence relating to Arts, Manufactures, &c.

(Authentic Communications for this Department of our Work will be thankfully received.)

Ballinasloe Farming Society.

THE fifth annual show of breeding stock since the commencement of the institution lately took place here. The improvement has been progressive, and has surpassed the most sanguine hopes of the Society. The young stock appeared far superior to those from which they were bred, which is to be attributed to judicious selection, and the soil and climate of Ireland, so favourable to cattle: a few excellent specimens were exhibited, the produce of a single cross on the native breeds. Five distinct varieties of neat cattle appeared, each contending for a decided superiority over all the rest. Such a competition, repeated for a series of years, must ultimately

mately overcome prejudice, and determine which is best. The sheep were excellent in their kinds; the new Leicesters still hold their place as the most profitable for the low-land pastures, and the South-Down for the upland districts; the latter were much better than any hitherto produced, and some were deservedly admired. There were also some fine-woolled sheep, by Spanish rams on Ryeland ewes. More attention than usual was paid to the quality of the different kinds of wool. The judges were gentlemen of experience, and they were assisted by a professional man.

The only draft stallion exhibited was a Suffolk punch. Nothing is more wanted in Ireland than an improvement in horses; and this breed being strong, active, and spirited, promises to be an acquisition. The improved breed of swine have spread through every part of Ireland, and are likely soon to displace the awkward unprofitable animal which was a disgrace to the country.

Extraordinary Produce.

In spring last, a single pea had dropped accidentally in the garden of Clay-potts, Perth, possessed by Mr. James Laird; the produce of which was lately pulled, and the pods carefully counted, to the amount of 299, exclusive of a great number which had been previously devoured by birds. On an average, each pod contained four peas, so that the total produce was nearly 1,200 grains.

There was taken up in a garden in the Black-Friars, Perth, a potatoe which weighed 2 lb. 4 oz. There were besides, at the same root, several others larger than the common size, and a number of smaller ones. What is deserving of notice, it was of the spotted Virginia kind, a species which seldom grows to a great bulk, and was

not

not planted, but produced from a potatoe that had been left in the ground last year. From another root, produced in the same manner, were taken up ten potatoes, some of which weighed a pound and a half, and weighed together nine pounds, besides six others of an ordinary size.

Cheviot Sheep.

It is hardly to be credited how much this excellent sort of sheep has been improved by the various breeders who have directed their attention to that object, both on the borders and in the Northern parts of Scotland. The excellence of their fleece is well known, and the shape and size of the carcase have been so much improved as to fetch, when fully fed, as high a price as three pounds each. A wether of the pure Cheviot breed was exhibited and killed for the show of sheep held at Camp-House, near Edgerton, on the 4th of September last, and weighed as follows:

		stone.	lbs.
Live weight - - - - - - - - -		13	0
Dead weight.	The four quarters -	7	12½
	Tallow - - - - -	0	17½
	Blood - - - - - -	0	7½
	Entrails - - - - -	1	0
	Head and feet - -	0	9½
	Strap - - - - - -	0	7
	Skin - - - - - -	0	13½

This sheep was bred at a farm called Langwall, in Caithness, and was bought by Mr. George Currie, of Hallrule, near Jedburgh, on the 15th of October 1802, at two years old. The price was at the rate of 1*l.* 6*s.* As soon as bought he was laid upon turnips, and kept on them for twenty-six weeks; he was afterwards put on common pasture with the farmer's stock sheep; again put

put on turnips about the 1st of November 1803, and kept on them till the beginning of April; and then kept, with the other stock sheep, on common pasture till he was killed. No particular attention was paid to feeding him high; but, as he throve well, Mr. Currie thought it would be right to bring him to the show, that it might be seen to what perfection the breeding of the Cheviot sheep was brought in the North.

Specimens of the Leicester, the South-Down, the Border Cheviot, and the black-faced, or forest breeds, were exhibited at Camp-House at the same time, none of which seemed to give greater satisfaction than the above-described.

Meteorology.

Depth of rain fallen in Liverpool during 1804, and amount of water evaporated out of a vessel four inches diameter, placed out of the reach of the solar rays, or influence of fire,

	Fall of Rain	Evaporation of Water, &c.
Amount continued from vol. V. p. 319, Jan. and June inclusive . .	Inches. 12,66	Inches. 11,4
July	1,9	3,3
August	2,35	3,
September	1,67	2,12
October	5,90	1,75
November	3,	1,25
December	2,40	1,50
Total	29,8	24,32

As measured by G. J. Liverpool.

List

List of Patents for Inventions, &c.

(Continued from Page 160.)

JOHN EDWARDS, of Bow-street, in the county of Middlesex, Currier and Harness-maker; for improvements in fire-places, calculated to save fuel, give a more general heat, and prevent chimnies from smoaking. Dated December 4, 1804.

MATTHEW GREGSON, of Liverpool, Upholder; for a method of cleaning feathers for beds, and hair, wool, down, and other the natural covering of birds and animals, from their animal oil, in the most perfect manner, and in such a way as to render them more healthful, sweet, and pleasant for use. Dated December 4, 1804.

STEPHEN PASQUIER, of Wilderness-row, Charter-house-square, in the county of Middlesex, Professor of Languages; for his new-invented manufacture, system, or method of writing, printing, engraving, drawing, painting, stamping, working, and using, certain characters, figures, instruments, and machines, for facilitating correspondence and other literary operations. Dated December 19, 1804.

WILLIAM EVERHARD, Baron Von Doornick, of Wells-street, in the county of Middlesex; for certain compositions formed by uniting an absorbent or detergent earth with other ingredients, so as to render the same more effectual in washing or scouring, and for various purposes to which soaps or detergent earths are now applied. Dated December 19, 1804.

JOSEPH WILLIAM MAYER, of Soho-square, in the county of Middlesex, Esquire; for improvements upon bits of bridles. Dated December 19, 1804.

SAMUEL

SAMUEL GUPPY, of the city of Bristol, Merchant; for additions to, and improvements on, machines for cutting, heading, and finishing nails, and the mode of working thereof. Dated December 19, 1804.

SOLOMON HOUGHAM, of Aldersgate-street, in the city of London, Goldsmith; for his new-invented spring-clasps for buckles, lockets, and other ornaments of dress. Dated December 19, 1804.

THOMAS MARGRAVE, of the parish of Saint Mary, Whitechapel, in the county of Middlesex, Silk-thrower; for his new-invented mills and machinery, upon a new and improved construction, for throwing, spinning, doubling, and twisting silk-thread, cotton-thread, flax-thread, hemp-thread, and all such other articles as usually are or may be thrown, spun, doubled, or twisted. Dated December 19, 1804.

JOHN GOVER, of Rotherhithe, in the county of Surrey, Gun-carriage-maker; for improvements and additions in the construction of a certain carriage for all sorts of cannon. Dated December 19, 1804.

RICHARD WILLCOX, of the city of Westminster, Engineer; for his new-invented machinery for more expeditiously cutting, stripping, or plucking, the various furs of beavers, seals, wool, hair, &c. from the various skins now plucked or stripped by hand; and for sundry methods of preparing and cleansing the said skins. Dated December 19, 1804.

EDWARD STEERS, of the Inner Temple, Esquire; for his new-invented engine, producing a force by the impetus which the parts of a fluid body have to an equal altitude, applicable to the working of all sorts of machinery. Dated December 19, 1804.

ABRAHAM UNDERDOWN, of the parish of Eling, in the county of Southampton, Gentleman; for a method of making flour without grain. Dated December 21, 1804.